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√ # Architectural Acoustics.

THE INSULATION OF SOUND.

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THE insulation of sound as an unsolved problem in architectural acoustics was first brought to the writer's attention by the New England Conservatory of Music, immediately after its completion in 1904, and almost simultaneously in connection with a private house which had just been completed in New York. A few years later it was renewed by the Institute of Musical Art in New York. In the construction of all three buildings it had been regarded as particularly important that communication of sound from room to room should be avoided, and methods to that end had been employed which were in every way reasonable. The results showed that in this phase of architectural acoustics also there had not been a sufficiently searching and practical investigation and that there was no experimental data on which an architect could rely. As these buildings were the occasion for beginning this investigation, and were both instructive and suggestive, they are, with the consent of the architects, discussed here at some length.

The special method of construction employed in the New England Conservatory of Music was suggested to the architects by the Trustees of the Conservatory. The floor of each room was of semi-fireproof construction, cement between iron girders, on this a layer of plank, on this paper lining, and on top of this a floor of hard pine. Between each room for violin, piano, or vocal lessons was a compound wall, constructed of two partitions with an unobstructed air space between them. Each partition was of two-inch plaster block set upright, with the finishing plaster applied directly to the block. The walls surrounding the organ rooms were of three such partitions separated by two-inch air spaces. In each air space was a continuous layer of deadening cloth. The scheme was carried out consistently and with full regard to details, yet lessons conducted in adjacent rooms were disturbing to each other.

It is always easier to explain why a method does not work than to know in advance whether it will or will not. It is especially easy to explain why it does not work when not under the immediate necessity of correcting it or of supplying a better. This lighter rôle of the irresponsible critic was alone invited in the case of the New England Conservatory of Music, nor will more be ventured at the present moment.

There is no question whatever that the fundamental consideration on which the device hinged was a sound one. Any discontinuity diminishes the transmission of sound; and the transition from masonry to air is a discontinuity of an extreme degree. Two solid masonry walls entirely separated by an air space furnish a vastly better sound insulation than either wall alone. On the other hand, the problem takes on new aspects if a masonry wall be replaced by a series of screen walls, each light and flexible, even though they aggregate in massiveness the solid wall which they replace. Moreover, such screen walls can rarely be regarded as entirely insulated from each other. Granting that accidental communication has nowhere been established, through, for example, the extrusion of plaster, the walls are of necessity in communication at the floor, at the ceiling, at the sides, or at the door jambs; and the connection at the floor, at least, is almost certain to be good. Further, and of extreme importance, given any connection at all, the thinness of the screen walls renders them like drumheads and capable of large response to small excitation.

It may seem a remote parallel, but assume for discussion two buildings a quarter of a mile apart. With the windows closed, no ordinary sound in one building could be heard in the other. If, however, the buildings were connected by a single metal wire fastened to the centers of window panes, it would be possible not merely to hear from within one building to within the other, but with care to talk. On the other hand, had the wires been connected to the heavy masonry walls of the two buildings, such communication would have been impossible. This hypothetical case, though extreme, indeed perhaps the better because of its exaggeration, will serve to analyze the problem. Here, as in every case, the transmission of sound involves three steps, — the taking up of the vibration, the function of the nearer window pane, its transmission by the wire, and its communication to the air of the receiving room by the remote window. The three functions may be combined into one when a solid wall separates the two rooms, the taking up, transmitting, and emitting of the sound being scarcely separable processes. On the other hand, they are often clearly separable, as in the case of multiple screen walls.

In the case of a solid masonry wall, the transmission from surface to surface is almost perfect; but because of the great mass and rigidity of the wall, it takes up but little of the vibration of the incident sound. It is entirely possible to express by a not very complicated analytical equation the amount of sound which a wall of simple dimensions will take up and transmit in terms of the mass of the wall, its elasticity, and its viscosity, and the frequency of vibration of the sound. But such an equation,

while of possible interest to physicists as an exercise, is of no interest whatever to architects because of the difficulty of determining the necessary coefficients.

In the case of multiple screen walls, the communication from wall to wall, through the intermediate air space or around the edges, is poor compared with the face to face communication of a solid wall. But the vibration of the screen wall exposed to the sound, the initial step in the process of transmission, is greatly enhanced by its light and flexible character. Similarly its counterpart, the screen wall, which by its vibration communicates the sound to the receiving room, is light, flexible, and responsive to relatively small forces. That this responsiveness of the walls compensates or more than compensates for the poor communication between them, is the probable explanation of the transmission between the rooms in the New England Conservatory.

The Institute of Musical Art in New York presented interesting variations of the problem. Here also the rooms on the seeond and third floors were intended for private instruction and were designed to be sound proof from each other, from the corridor, and from the rooms above and below. The walls separating the rooms from the corridors were double, having connection only at the door jambs and at the floor. The screen wall next the corridor was of terra cotta block, finished on the corridor side with plaster applied directly to the terra cotta. The wall next the room was of gypsum block, plastered and finished in burlap. In the air space between the two walls, deadening sheet was hung. The walls separating the rooms were of gypsum block and finished in hard plaster and burlap. As shown on the adjacent diagram (Fig. 1), these walls were cellular, one of these cells being entirely enclosed in gypsum block, the others being closets opening the one to one room, the other to the other. The closets were lined with wood sheathing which was separated from the enclosing wall by a narrow space in which deadening sheet was hung in double thickness with overlapping joints. In the entirely enclosed cell, deadening sheet was also hung in double thickness.

It is not difficult to see, at least after the fact, why the deadening sheet in such positions was entirely without effect. The transverse masonry webs afforded a direct transmission from side to side of the compound wall that entirely overwhelmed the transmission through the air spaces. Had there been no necessity of closets, and therefore no necessity of transverse webs, and had the two screen walls been truly insulated the one from the other, not merely over their area, but at the floor, at the ceiling, and at the edges, the insulation would have been much more nearly perfect.

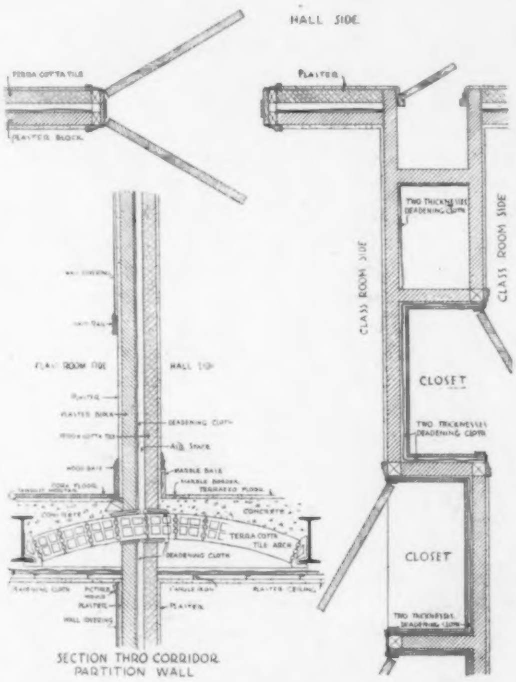


Fig. 1. Details of Construction, Institute of Musical Art, New York, N. Y.

The means which were taken to secure insulation at the base of the screen walls and to prevent the transmission of sound from floor to floor are exceedingly interesting. The floor construction consisted in hollow terra cotta tile arches, on top of this cinder concrete, on this sawdust mortar, and on the top of this cork flooring. Below the reinforced concrete arches were hung ceilings of plaster on wire lath. This hung ceiling was supported by crossed angle bars which were themselves supported by the I beams which supported the hollow terra cotta tile arches. In the air spaces between the tile arches and the hung ceilings, and resting on the latter, was deadening sheet. This compound floor of cork, sawdust mortar, cinder concrete, terra cotta tile, air space, and hung ceiling, with deadening sheet in the air spaces, has the air of finality, but was not successful in securing the desired insulation.

It is interesting to note also that the screen walls were separated from the floor arches on which they rested below and on which they abutted above by deadening sheet. It is possible that this afforded some insulation at the top of the wall, for the arch was not sustained by the wall, and the pressure at that point not great. At the bottom, however, it is improbable that the deadening sheet carried under the base offered an insulation of practical value. Under the weight of the wall it was probably compressed into a compact mass, whose rigidity was still further increased by the percolation through it of the cement from the surrounding concrete.

Finally, after the completion of the building, Mr. Damrosch, the director, had tried the experiment of covering the walls of one of the rooms to a depth of two inches with standard hair felt, with some, but almost negligible, effect on the transmission of sound.

Deadening sheet has been mentioned frequently. All indication of the special kind employed has been purposely omitted, for the discussion is concerned with the larger question of the manner of its use and not with the relative merits of the different makes.

The house in New York presented a problem even more interesting. It was practically a double house, one of the most imperative conditions of the building being the exclusion of sounds in the main part of the house from the part to the left of a great partition wall. This wall of solid masonry supported only one beam of the main house, was pierced by as few doors as possible, — two, — and by no steam or water pipes. The rooms were heated by independent fireplaces. The water pipes connected independently to the main. It had been regarded as of particular importance to exclude sounds from the two bedrooms on the second floor. The ceilings of the rooms

below were therefore made of concrete arch; on top of this was spread three inches of sand, and on top of this three inches of lignolith blocks; on this was laid a hardwood floor; and finally, when the room was occupied, this floor was covered by very heavy and heavily padded carpets. From the complex floor thus constructed arose interior walls of plaster on wire lath on independent studding, supported only at the top where they were held from the masonry walls by iron brackets set in lignolith blocks. Each room was therefore practically a room within a room, separated below by three inches of sand and three inches of lignolith and on all sides and above by an air space. Notwithstanding this, the shutting of a door in any part of the main house could be heard, though faintly, in either bedroom. In the rear bedroom, from which the best results were expected, one could hear not merely the shutting of doors in the main part of the house, but the working of the feed pump, the raking of the furnace, and the coaling of the kitchen range. In the basement of the main dwelling was the servants' dining room. Rapping with the knuckles on the wall of this room produced in the bedroom, two stories up and on the other side of the great partition wall, a sound which, although hardly, as the architect expressed it, magnified, yet of astonishing loudness and clearness. In this case, the telephone-like nature of the process was even more clearly defined than in the other cases, for the distances concerned were much greater. The problem had many interesting aspects, but will best serve the present purpose if for the sake of simplicity and clearness it be held to but one, — the transmission of sound from the servants' dining room in the basement along the great eighteen-inch partition wall up two stories to the insulated bedroom above and opposite.

It is a fairly safe hazard that the sound on reaching the bedroom did not enter by way of the floor, for the combination of reinforced concrete, three inches of sand, three inches of lignolith block, and the wood flooring and carpet above, presented a combination of massive rigidity in the concrete arch, inertness in the sand and lignolith block, imperviousness in the hardwood floor, and absorption in the padded carpet which rendered insulation perfect, if perfect insulation be possible. No air ducts or steam or water pipes entered the room. The only conceivable communication, therefore, was through the walls or ceiling. The communication to the inner walls and ceiling from the surrounding structural walls was either through the air space or through the iron angle bars, which, set in lignolith blocks in the structural wall, retained erect and at proper distance the inner walls. Of the two means of communication, the air and the angle bars, the latter was probably the more important. It is interesting and pertinent to follow this line of communication, the masonry wall, the angle bars, and the screen walls, and to endeavor to discover if possible, or at least to speculate on the reason for its exceptional though unwelcome efficiency.

From the outset it is necessary to distinguish the transverse and the longitudinal transmission of sound in a building member, that is, to distinguish as somewhat different processes the transmission of sound from one room to an adjacent room through a separating wall or ceiling, from the transmission of sound along the floors from room to room, or along the vertical walls from floor to floor. Broadly, although the two are not entirely separable phenomena, one is largely concerned in the transmission of the sound of the voice, or the violin, or of other sources free from solid contact with the floor, and the other in the transmission of the sound of a piano or cello, — instruments in direct communication with the building structure, — or of noises involved in the operation of the building, dynamos, elevators, or the opening and closing of doors. In the building under consideration, the disturbing sounds were in every case communicated directly to the structure at a considerable distance and transmitted along the walls until ultimately communicated through the angle bars, if the angle bars were the means of communication, to the thin plaster walls which constituted the inner room. The special features thus emphasized were the longitudinal transmission of vibration by walls, floors, and structural beams, and the transformation of these longitudinal vibrations into the sound-producing transverse vibrations of walls and ceilings bounding the disturbed room. Many questions were raised which at the time could be only tentatively answered.

What manner of walls conduct the sound with the greater readiness? Is it true, as so often stated, that modern concrete construction has contributed to the recent prevalence of these difficulties? If so, is there a difference in this respect between stone, sand, and cinder concrete? In this particular building, the partition wall was of brick. Is there a difference due to the kind of brick employed, whether hard or soft? Or does the conduction of sound depend on the kind of mortar with which the masonry is set? If this seems trivial, consider the number of joints in even a moderate distance. Again, is it possible that sound may be transmitted along a wall without producing a transverse vibration, thus not entering the adjacent room? Is it possible that in the case of this private house had there been no interior screen wall the sound communicated to the room would have been less? We know that if the string of a string telephone passes through a room without touching, a conversation held over the line will be entirely inaudible in the room. Is it possible that something like this, but on a grand scale, may happen in a building? Or, again, is it possible that the iron brackets which connected the great partition wall to the screen wall magnified the motion and so the sound, as the lever on a phonograph magnifies its motion? These are not unworthy questions, even if ultimately the answer be negative.

The investigation divides itself into two parts, — the one dealing with partition walls especially constructed for the test, the other with existing structures wherever found in interesting form. The experiments of the former type were conducted in a special room, mentioned in some of the earlier papers (THE BRICKBVILDER, January, 1914), and having peculiar merits for the work. For an understanding of these experiments and an appreciation of the conditions that make for their accuracy, it is necessary that the construction of this room be explained at some length. The west wing of the Jefferson Physical Laboratory is in plan a large square in the center of which rises a tower, which, for the sake of steadiness and insulation from all external vibration, is not merely of independent walls but has an entirely separate foundation, and above is spanned without touching by the roof of the main building. The sub-basement room of this tower is below the basement of the main building, but the walls of

the latter are carried down to enclose it. The floor of the room is of concrete, the ceiling a masonry arch. There is but one door which leads through a small anteroom to the stairs mounting to the level of the basement of the main building. Through the ceiling there are two small openings for which special means of closing are provided. The larger of these openings barely permits the passage of an observer when raised or lowered by a block and tackle. It is necessary that there be some such entrance in order that observations may be taken in the room when the door is closed by the wall construction undergoing test.

Of prime importance, critical to the whole investigation, was the insulation between the rooms, otherwise than through the partition to be tested. The latter closed the doorway. Other than that the two rooms were separated by two eighteen-inch walls of brick, separated by a one-inch air space, not touching through a five-story height and carried down to separate foundations. Around the outer wall and around the antechamber was solid ground. It is difficult to conceive of two adjacent rooms better insulated, the one from the other, in all directions, except in that of their immediate connection.

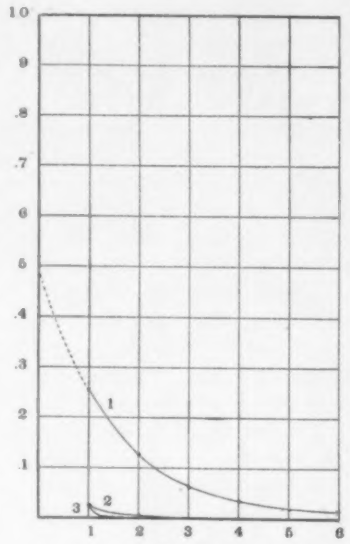


Fig. 2

The arrangement of apparatus, changed somewhat in later experiments, consisted primarily, as shown in the diagram, of a set of organ pipes, winded from a bellows reservoir in the room above, this in turn being charged from an air pump in a remote part of the building — remote to avoid the noise of operation. In the center of the room two reflectors revolved slowly and noiselessly on roller bearings, turned continuously by a weight, under governor control, in the room above. The chair of the observer was in a box whose folding lids fitted over his shoulders. In the box was the small organ console and the key of the chronograph. The organ and chronograph had also console and key connection with the antechamber. The details of the apparatus are not of moment in a paper written primarily for architects.

Broadly, the method of measuring the transmission of sound through the partitions consisted in producing in the larger room a sound whose intensity in terms of threshold audibility was known, and reducing this intensity at a determinable rate until the sound ceased to be audible on the other side of the partition. The intensity of the sound at this instant was numerically equal to the reciprocal of the coefficient of transmission. This process involved several considerations which should be at least mentioned.

The sound of known intensity was produced by organ pipes of known powers of emission, allowance being made for the volume of the room and the absorbing power of the walls. The method was fully explained in earlier papers.* It is to be borne in mind that there was thus determined merely the average of intensity. The intensity varied greatly in different parts of the room because of interference. In order that the average intensity of sound against the partition in a series of observations should equal the average intensity in the room, it was necessary to continuously shift the interference system. This was accomplished by means of revolving reflectors. This also rendered it possible to obtain a measure of average conditions in the room from observations taken in one position. Finally the observations in the room were always made by the observer seated in the box, as this rendered his clothing a negligible factor, and the condition of the room the same with or without his presence. Consideration was also given to the acoustical condition of the antechamber.

Two methods of reducing the sound have been employed. In the one the sound was allowed to die away naturally, the source being stopped suddenly, and the rate at which it decreased determined from the constants of the room. In another type of experiment the source, electrically maintained, was reduced by the addition of electrical resistance to the circuit. One method was suitable to one set of conditions, the other to another. The first was employed in the experiments whose results are given in this paper.

The first measurements were on felt, partly suggested by the experiments of Dr. Damrosch with felt on the walls of the Institute of Musical Art, partly because it offered the dynamically simplest problem on which to

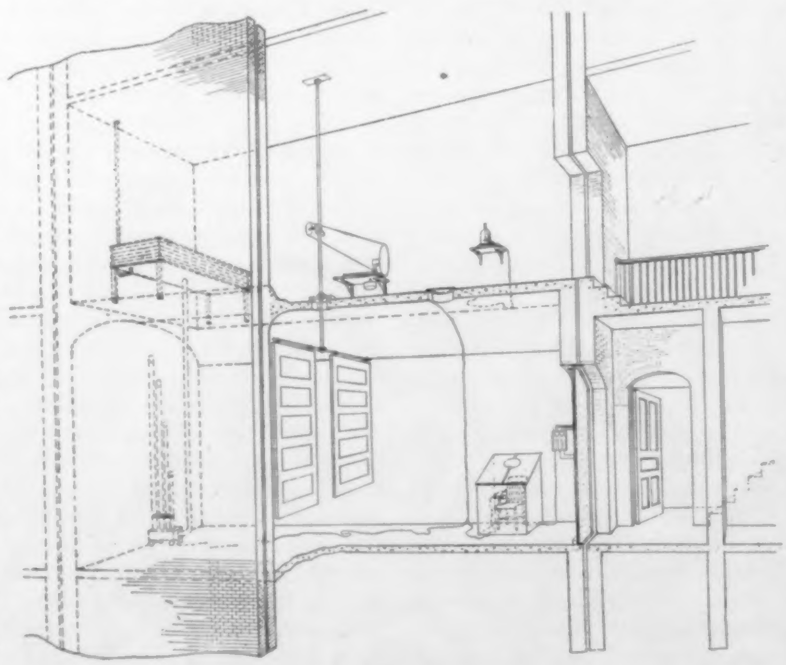


Fig. 3. Testing Room and Apparatus

* *The American Architect* for 1909.

test the accuracy of the method by the concurrence of its results. The felt used was that so thoroughly studied in other acoustical aspects in the paper published in the Proceedings of the American Academy of Arts and Sciences in 1906. The door separating the two rooms was covered with a one-half inch thickness of this felt. The intensity of sound in the main room just audible through the felt was 3.7 times threshold audibility. Another layer of felt of equal thickness was added to the first, and the reduction in the intensity of sound in passing through the two was 7.8 fold. Through three-thickness, each one-half, the reduction was 15.4 fold, through four 30.4, five 47.5, and six 88.0. This test was for sounds having the pitch of violin c, first c above middle c, 512 vibrations per second.

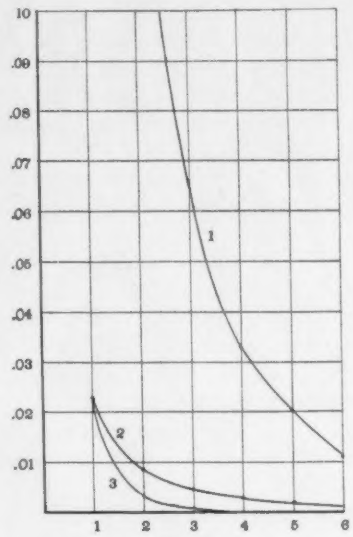


Fig. 4

There is another way of stating the above results which is perhaps of more service to architects. The ordinary speaking intensity of the voice is, — not exactly, of course, for it varies greatly, — but of the order of magnitude of 1,000,000 times minimum audible intensity. Assume that there is a sound of that intensity, and of the pitch investigated, in a room in one side of a partition of half-inch felt. Its intensity on the other side of the partition would be 270,000 times minimum audible intensity. Through an inch of felt its intensity would be 128,000. Through six layers of such felt, that is, through three inches, its intensity would be 11,400 times minimum audible intensity — very audible, indeed. The diminishing intensity of the sound as it proceeds through layer after layer of felt is plotted in the adjacent diagram, (Curve 1, Fig. 2), in which all the points recorded are the direct results of observations. The intensity inside the room is the full ordinate of the diagram. The curve drawn is the nearest rectangular hyperbola fitting the observed and calculated points. The significance of this will be discussed later. It is sufficient for the present purpose to say that it is the theoretical curve for these conditions, and the close agreement between it and the observed points is a matter for considerable satisfaction.

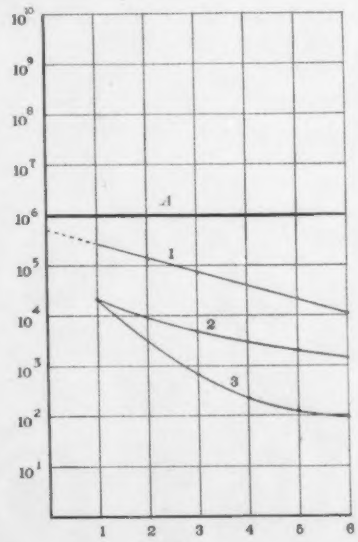


Fig. 5

The next partition tested was of sheet iron. This, of course, is not a normal building material and it may therefore seem disappointing and without interest to architects. But it is necessary to remember that these were preliminary investigations establishing methods and principles rather than practical data. Moreover, the material is not wholly impractical. The writer has used it in recommendations to an architect in one of the most interesting and successful cases of sound insulation so far undertaken — that in an after-theater restaurant extending underneath the sidewalk of Broadway and 42d street in New York.

The successive layers of sheet iron were held at a distance, each from the preceding, of one inch, spaced at the edges by a narrow strip of wood and felt, and pressed home by washers of felt. After the practical cases cited at the beginning of the paper, it requires courage and some hardihood to say that any insulation is good. It can only be said that every care was taken to this end. The results of the experiments can alone measure the efficiency of the method employed, and later they will be discussed with this in view.

The third series of experiments were with layers of sheet iron with one-half inch felt occupying part of the air space between them. The iron was that used in the second series, the felt that used in the first. The air space was unfortunately slightly greater than in the second series, being an inch and a quarter instead of an inch. The magnitude of the effect of this difference in distance was not realized at the time, but it was sufficient to prevent a direct comparison of the second and third series, and an attempt to deduce the latter from the former with the aid of the first. When this was realized, other conditions were so different as to make a repetition of the series difficult.

In the following table is given the results of these three series of experiments in such form as to admit of easy comparison. To this end they are all reduced to the values which they would have had with an intensity of sound in the inner room of 1,000,000. In the first column each succeeding figure is the intensity outside an additional half inch of felt. In the second column, similarly, each succeeding figure is the intensity outside an additional sheet of iron. In the third column, the second figure is the intensity outside a single sheet of iron and after that each succeeding figure is the intensity outside of an additional felt and iron doublet with air space.

1,000,000	1,000,000	1,000,000
270,000	22,700	23,000
128,000	8,700	3,300
65,000	4,880	700
33,000	3,150	220
21,500	2,060	150
11,400	1,520	88

The sound transmitted in the second and third series is so much less than in the first that when an attempt is made to plot it on the same diagram (Curves 2 and 3, Fig. 2) it results in lines so low as to be scarcely distinguishable from the base line. Magnifying the scale tenfold (Fig. 4) throws the first series off the diagram for the earlier values, but renders visible the second and third.

The method of representing the results of an investigation graphically has several ends in view: it gives a visual impression of the phenomenon; it shows by the nearness

with which the plotted values* lie to a smooth curve the accuracy of the method and of the work; it serves to interpolate for intermediate values and to extrapolate for points which lie beyond the observed region, forward or backward; finally, it reveals significant relations and leads to a more effective discussion. It is worth while thus examining the three curves.

Attention has already been called to the curve for felt, to its extrapolation, and to the close approximation of the observed points to an hyperbola. The latter fact indicates the simplest possible law of absorption. It proves that all layers absorb the same proportion of the sound; that each succeeding layer absorbs less actual sound than the preceding, but less merely because less sound reaches it to be absorbed. In the case in hand the sound in passing through the felt was reduced in the ratio 1.88 in each layer, 3.53 in each inch. It is customary to test such curves by plotting them on a special kind of co-ordinate paper — one on which, while horizontal distances are uniformly scaled as before, vertical distances are scaled with greater and greater reduction, tenfold for each unit rise. On such co-ordinate paper the vertical distances are the power to which 10 must be raised to equal the number plotted — in other words, it is the logarithm of the number. Plotted on such paper the curve for felt will result in a straight line, if the curve in the other diagram was an hyperbola, and if the law of absorption was as inferred. How accurately it does so is shown in Curve 1, Fig. 5.

When the observations for iron, and for felt and iron, are similarly plotted (Curves 2 and 3, Fig. 5), the lines are not straight, but strongly curved upward, indicating that the corresponding curves in the preceding diagram were not hyberbolas, and that the law of constant coefficient did not hold. This must be explained in one or the other of two ways. Either there was some by-pass for the sound, or the efficiency of each succeeding unit of construction was less.

The by-pass as a possible explanation can be quickly disposed of. Take, for example, the extreme case, that for felt and iron, and make the extreme assumption that with the completed series of six screens all the sound has come by some by-pass, the surrounding walls, the foundations, the ceiling, or by some solid connection from the innermost to the outermost sheet. A calculation based on these assumptions gives a plot whose curvature is entirely at the lower end and bears no relationship to the observed values. In the other case, that of the iron only, a similar calculation gives a similar result; moreover, the much lower limit to which the felt and iron screens reduced the sound wholly eliminates any by-pass action as a vital factor in the iron-only experiment.

The other explanation is not merely necessary by elimination, but is dynamically rational. The screen walls such as here tested, as well as the screen walls in the actual construction described by way of introduction, do not act by absorption, as in the case of the felt; do not act by a process which is complete at the point, but rather by a process which in the first screen may be likened to reflection, and in the second and subsequent screens by a process which may be more or less likened to reflection, but which being in a confined space reacts on the screen or screens which have preceded it. In fact, the process must be regarded not as a sequence of independent steps or a progress of an independent action, but as that of a structure which must be considered dynamically as a whole.

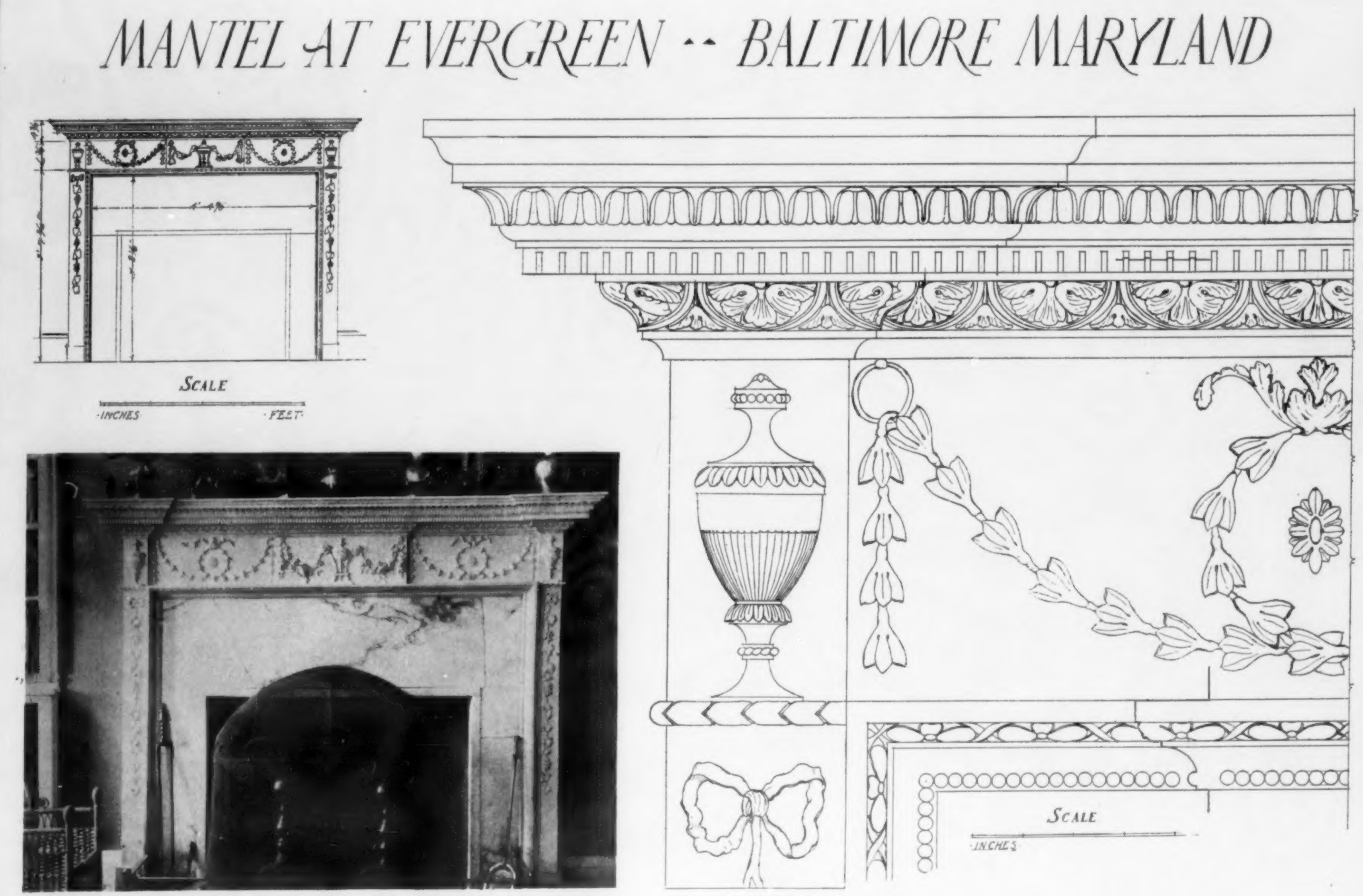
When the phenomenon is one of pure absorption, as in felt, it is possible to express by a simple formula the intensity of the sound I, at any distance x, in terms of the initial intensity I_o,

$$I = I_o R k^{-x},$$

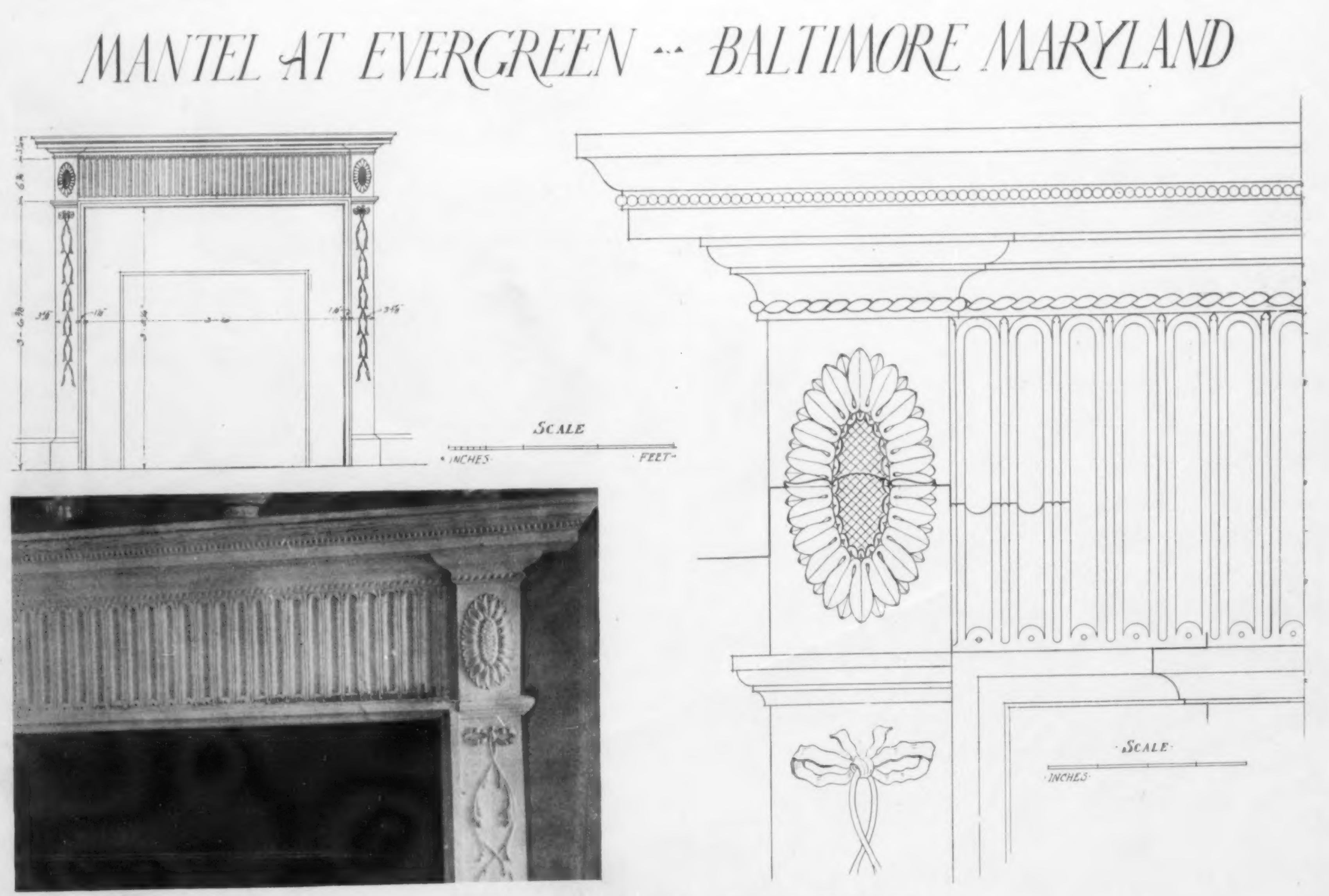
where R represents the factor of surface discontinuity, and k the ratio in which the intensity is reduced in a unit distance. In the case of the felt tested, R is .485 and k is 3.53, the distance into the felt being measured in inches. As an application of this formula, one may compute the thickness of felt which would entirely extinguish a sound of the intensity of ordinary speech 10.4 inches. It is not possible to express by such a formula the transmission of sound through either of the more complex structures. However, it is possible to extrapolate empirically and show that 10.4 inches of neither would accomplish this ideal result, although they are both far superior to felt for thicknesses up to three inches in one case and five and one-half inches in the other.

A number of other experiments were tried during this preliminary stage of the investigation, such, for example, as increasing the distance between the screen walls, but it is not necessary to recount them here. Enough has already been given to show that a method had been developed for accurately measuring the insulating value of structures; more would but confuse the purpose. At this point the apparatus was improved, the method recast, and the investigation begun anew, thenceforward to deal only with standard forms of construction, and for sounds, not of one pitch only, but for the whole range of the musical scale.

** In reproducing from the plotted diagrams for Figs. 2, 4, and 5, the dots, in some cases, which indicated the plotted values of the observed points, do not clearly appear in distinction on the lines. The greatest divergence, in any case, from the line drawn was not more than twice the breadth of the line itself.*



DETAIL OF OLD MANTEL AT "EVERGREEN," BALTIMORE, MD.
MEASURED DRAWING BY RIGGIN BUCKLER



DETAIL OF OLD MANTEL AT "EVERGREEN," BALTIMORE, MD.
MEASURED DRAWING BY RIGGIN BUCKLER

The Modern Schoolhouse.

II. CORRIDORS AND STAIRWAYS.

By WALTER H. KILHAM.

THE ideal place for the corridor is, of course, along the outer wall of the building, so that it may have windows in the side opposite the class room doors. The air of cheerfulness and space which the architect can thus obtain, will go farther towards making the schoolhouse a really attractive place, which the pupils in later years will pleasantly recall, than almost any other single thing within the power of the architect to accomplish. Considerations of economy usually dictate in a large building that the main corridor shall become merely a sort of street, serving rooms on both sides; but such a corridor is almost inevitably dark and monotonous, even when furnished with casts and pictures, in inverse proportion to the amount of outside light that it receives. In small school buildings of eight or ten rooms, however, there is often no real obstacle to the longitudinal corridor with rooms along one side, and if the corridor can be broken by a sunny bay window, or some such feature, the pupils will enjoy the building more, even if constructional standards are violated. In any event outside light, if only at the ends, is essential, and the corridor should, when possible, run to the light.

Second Floor Corridor
The Michael Driscoll School, Brookline, Mass.
Kilham & Hopkins, Architects

Width of Corridor. Massachusetts law requires that corridors shall be well lighted and, if so directed, shall terminate on an egress; that they shall not be less than 10 feet wide in the clear for buildings with eight class rooms, and shall increase at least 1 foot in width for every two additional class rooms. They may decrease 1 foot in width for every two class rooms less than that number, and shall be free from sharp turns where circumstances will permit.

The Boston law requires corridors not less than 8 feet wide for four class rooms on a floor and not less than 10 feet for over four rooms, governed by length, access to stairs, etc. When the stairs are placed at the ends of the corridor, against a window, their width usually governs the width of the corridor. A corridor width of 10 feet 6 inches will take two runs of stairs each 5 feet wide with a 6-inch well-way, and this will be found to be a convenient width for the corridor when it is not used as the main exit from a large assembly hall. A greater width is a rather useless expense, except in corridors of great length, and tends to give an impression of loose planning, although it is often advocated by building committees.

Corridor Floors. The best material for these is probably terrazzo, hard and well polished. To avoid contraction cracks, it should be divided into areas of about 80 to 100 square feet by strips of slate or marble. A terrazzo floor is not as good when used upon wooden joists in second class construction on account of the shrinkage of the timbers, but it is by no means impracticable. It is not very much more costly, however, to span the corridors with reinforced concrete slabs or terra cotta tile arches, on which the terrazzo with its base of concrete can be laid easily and a permanently satisfactory result obtained.

Cement floors in general give trouble from "dusting" unless they are treated with some reliable concrete hardener or preservative. Sanford E. Thompson* recommends a granolithic floor made of cement, Plum Island sand, and crushed granite in a fairly stiff mixture, and then grinding off a thin layer, so as to show the grains of sand and the pieces of coarser aggregate. This gives a varied texture to the surface, showing the numerous colored grains and permits of pleasing effects by using aggregates of different colors. The surface becomes more glossy and dense, so that it is readily cleaned. Mr. Thompson's book gives definite specifications for the process.

Other suitable floor surfaces are tile, marble mosaic, and the various magnesium compositions. The latter in particular, when laid by good workmen, are more resilient and somewhat less noisy than terrazzo. It is difficult, however, to find this material in a satisfactory color. Tile and mosaic are ordinarily considered too expensive to be employed in school buildings. Some institutions have made use of a red granolithic floor grooved to imitate tile, complete with border of a different color, etc., but in regard to cleanliness a floor with an absolutely flush surface will be more satisfactory. Battleship linoleum may also be employed and in general, is more useful for corridors than for class rooms.

If the floor has to be of wood, maple is probably the best material; but the use of too much water in scrubbing should be discouraged, as it causes the wood to shrink and opens up cracks. The best treatment for a wooden floor, is oil and then more oil, which can be sprayed on

* "Floor Surfaces in Fireproof Buildings," by Sanford E. Thompson, reprinted from the *Journal of the American Society of Civil Engineers.*

cheaply, holds down the dust, and keeps the floor in excellent condition. There are also many patent preparations which have their advocates.

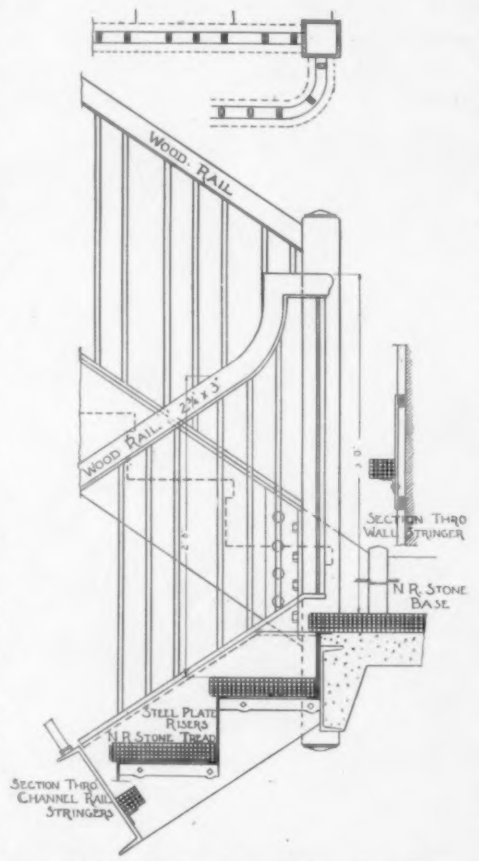
Corridor Walls. Light glazed or salt glazed bricks make probably the best wall surfacing for the lower portions, but many places employ burlap to a height of about 7 feet, or to the tops of the doors. A picture moulding at the ceiling is necessary.

Lights. The corridor will require ceiling or short pendant electric lighting fixtures of 32 candle power each and also emergency gas outlets. The stairways and vestibules should be similarly equipped.

Stairways. Any building of two or more stories should always be provided with more than one stairway, having outside light and leading directly to an egress doorway. The first requisite as to location of these stairs is to have them as widely separated as possible and at the terminations of the corridors, so that there will be no lengths of corridor or dead ends beyond the staircase from which there would be no egress. A single stairway in the center of a building is forbidden in most localities and should not be tolerated anywhere.

Much has been written as to the proper width for schoolhouse stairs. Boston forbids over 5 feet. Professor Dresslar recommends 5½ to 6 feet. It is evident that if pupils are to pass over the stairs more than three abreast, there will be need of a center rail. Three pupils can be perfectly well accommodated on a tread in a width of 5 feet, and a wider stair than this seems unnecessary. Professor Dresslar says that one hundred students in double file can easily descend a broad, well lighted stairway in thirty-five seconds, which time can be reduced by fire drills. Observation in the Chelsea, Mass., schools, shows that under ordinary conditions, a class of forty pupils, marching two abreast, completely descends one story in forty seconds. At the fire drill the same group of buildings containing two thousand pupils is emptied in two minutes, using seven exits — a rough average of three hundred pupils per exit. New York City requires each building to have a sufficient number of fireproof stairways and exits to permit of its occupants vacating the same in not over three minutes in fireproof and three and a half minutes in non-fireproof structures.

The rise and tread should be easy, 6½ or 7 inch rise by about 10½-inch tread. The handrail should be about 2 feet 8 inches high on the runs, and 3 feet 0 inches on landings. An additional low handrail is sometimes provided for small children. To avoid lodgment of dust and prevent injury, the balustrade should be of a simple pattern mainly in vertical lines, and the newels should be without projecting cap mouldings. Massachusetts law requires the steps of stairs to have a rise of not less than 6 inches nor more than 7 inches, and a run of more than 10 inches. There shall be not more than 15 nor less than three risers between landings. When returning on walls or directly upon themselves, the landings shall be the full width of both flights, and no winding steps shall be used and no closets shall be placed under any stairs. The last provision is extremely practical, for there is no place in a school building more likely to invite rubbish than the space under the short run of stairs from the vestibule to the first floor. In the event of a fire starting there, egress from that end of the building would be at once impossible. It is important, therefore, to make this flight fireproof even if the rest of the stairs have to be of wood and to close the whole space up solidly so that no closet of sheathing can ever be built there.



Detail of North River Stone Stairs on Steel Strings

In case there is an assembly hall above the second floor, a stairway width of 1 foot for every hundred persons which the hall is capable of seating is required, but no such stairway may be less than 4 feet 0 inches in width.

New York prescribes 4 feet 0 inches as a standard width of stair, but in that city many of the duplex stairways are in use, enclosed in wired glass and metal frame partitions. These have not come into general use in other cities, as a somewhat greater story height is implied and school buildings of the size and height of those in New York City are not common elsewhere.

In all cases "winders" should be prohibited and no door should open immediately on a flight of stairs, but a landing of at least the width of the door should be provided between such stairs and such doorway.

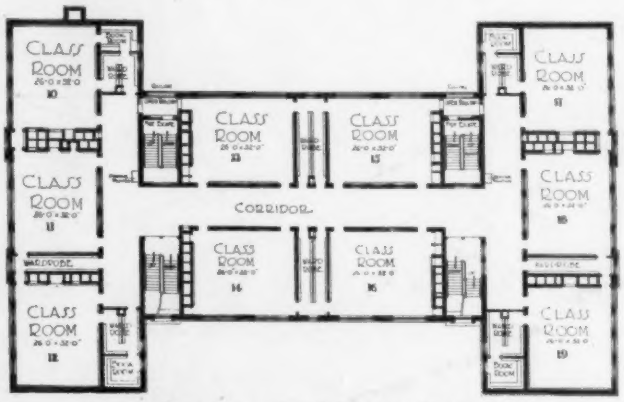
The New Jersey code requires the following: All stairways (except cellar stairs) must not be less than 4 feet in width and have intermediate landings. The stair risers must not exceed 7 inches in height and the treads must not be less than 12 inches in width, including the projecting nosings. A uniform width must be maintained in all stairways and platforms, and the rise and tread for each run must be uniform. Handrails are to be placed on both sides of all stairways used by pupils and the inside rail must be continuous. Winding stairs are not allowed and stairways constructed of reinforced concrete are required to have an approved non-slippable tread embedded in concrete.

All stairs must be constructed of fireproof materials except stairs in one-story buildings leading to the cellar or basement, which may be of slow-burning construction, with no open risers, and must be enclosed by fireproof walls and without open well holes.

All stairways in buildings of more than one story in height must be separated from the corridors by thick wooden, iron, or kalamein partitions. Doors shall swing towards the exits only and be glazed with polished wired glass. All such doors shall have door springs and checks, but no floor stops or other device to hold the door open will be allowed.

Buildings having more than two rooms and less than nine rooms on the second floor shall have two stairways, one at each end of the building, and each leading direct to an exit from the first floor to the ground. Every school building having nine or more class rooms on the second floor shall have at least three flights of stairs, one near each end of the building and each leading direct to an exit from the first floor to the ground.

Construction of Stairways. To require all stairways to be fireproof would seem like a hardship to many building committees in small communities who are accustomed to the cheapness in first cost of wooden stairs; but after the disasters of recent years it seems incredible that any other construction should be considered. The time may arrive when all school buildings will be only one story high, but until then we must endeavor to guarantee our buildings as far as possible against loss of life by fire. Either reinforced concrete or steel is a suitable material for stair construction; the main point of interest is the wearing surface which should be specified for the treads. The most satisfactory substance which the writer has used is North River stone in slabs about 2 inches thick, with smooth surface, which gives a most agreeable feeling of security and comfort to the feet, and seems to wear almost indefinitely. Slate has also been used to a considerable extent. It is hard and clean but does not wear as well as the North River stone. Slate treads examined recently which have had five years' use in a school running double sessions constantly, and hence receiving double wear, show an erosion at the end nearest the handrail of about one-quarter of an inch at the edge of the tread, diminishing towards the back. North River stone treads five years old in a school having single sessions show no appreciable wear at all. Concrete treads are subject to "dusting," and do not have as agreeable an appearance, nor do they "feel" as comfortable as either of the above.



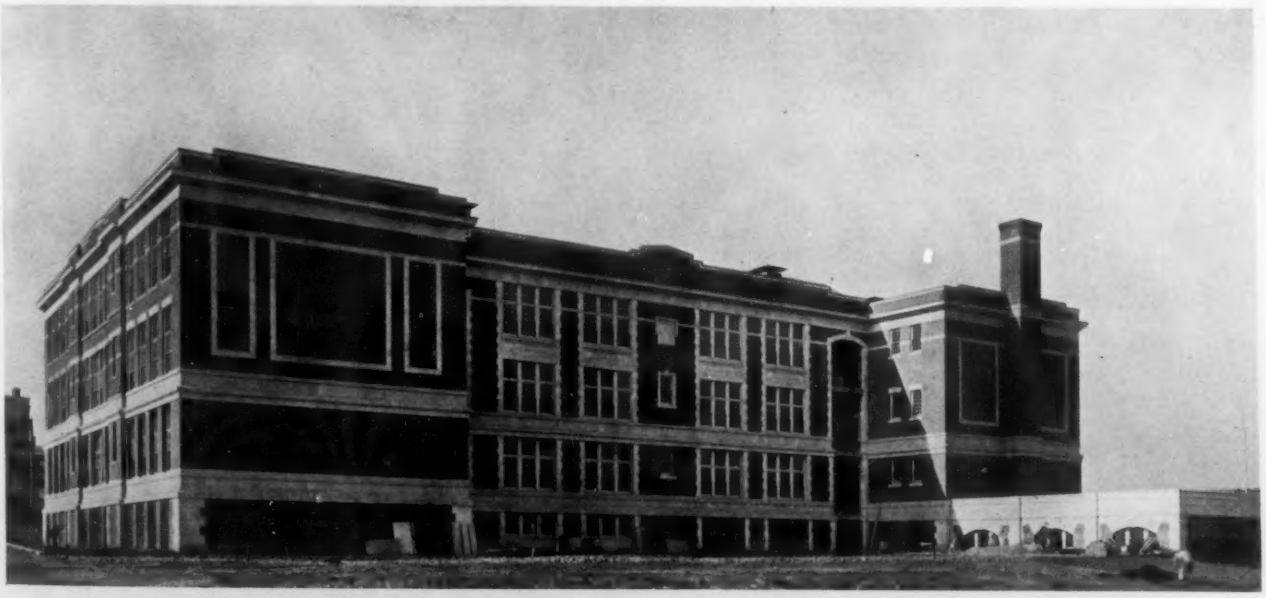
Second Floor Plan — Shurtleff School, Chelsea, Mass.

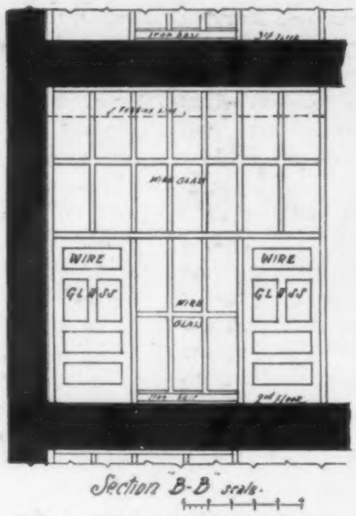
The landings may be of slate or North River stone on a steel frame, but a better way is to make them of reinforced concrete with terrazzo surface. The stairways may be rendered much lighter by painting the soffits white.

If the stairs have to be of wood, the treads should be protected by some form of "safety" or non-slipping tread, which is generally of iron with a filling of lead or carborundum, which renders them fairly safe against slipping and protects the wooden tread from wear.

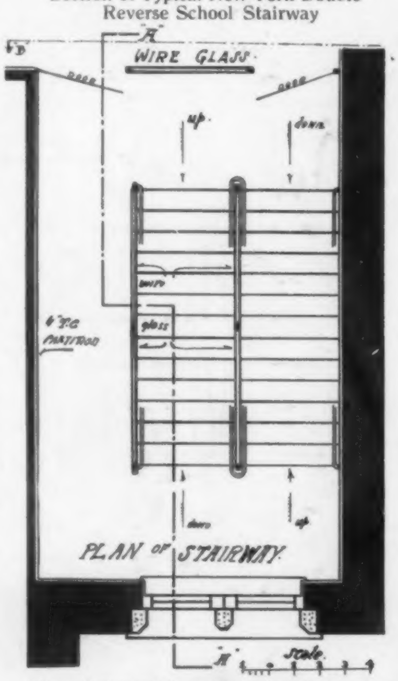
The walls surrounding a staircase should always be of masonry. Brick nogging and wire lath are frequently passed by complaisant inspectors and committees who wish to make a "record" for cheap construction; but this practice means taking a chance.

It ought to be constantly kept in mind that the principal fire risk in any well constructed building lies in the vertical openings in the floors. If there were no open stair wells,


Shurtleff School, Chelsea, Mass., before Construction of North Wing Showing Open Balconies for Fire Stairs
Kilham & Hopkins, Architects



Section of Typical New York Double Reverse School Stairway

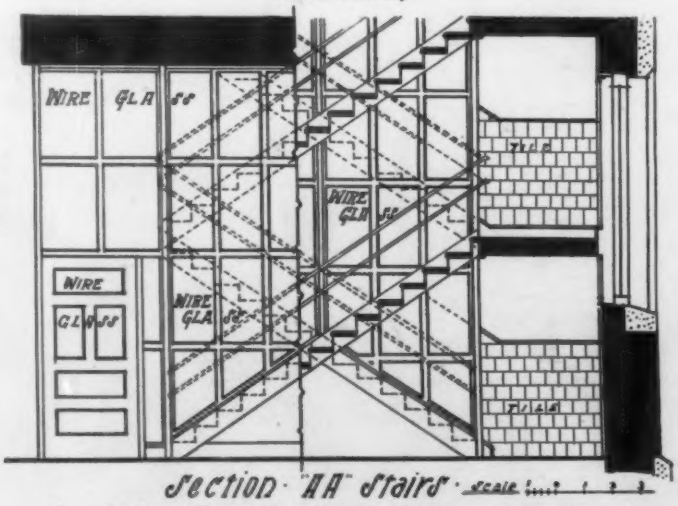


Plan of Typical New York Double Reverse School Stairway

even a building constructed of wood, and plastered on wood lath, would contain a fire in the story where it originated for a considerable time; but an open stair well causes an upward draft of air, which attracts smoke and flame. For these reasons, a self-closing door, shutting off the basement from the stair well, should never be omitted, even in the cheapest construction, and in this respect the new rules such as those of the Massachusetts District Police and of the City of New York should be carefully studied and followed in all schoolhouse construction. These, in short, require the installation of self-closing "smoke-doors," separating the stairway from the corridor, so that smoke or flame originating in one cannot be communicated to the other, whereby a chance may be maintained of keeping one exit clear, even if the other is full of smoke. Massachusetts requires that stairways from the basement to the first story, and elsewhere if so directed, shall be enclosed with fireproof walls with fireproofed self-closing doors, or wired glass not less than ¼ inch thick, set in metal frames, or if they suit conditions better, metal covered doors. These enclosures are always required for buildings of three stories and upwards and should be installed in those of two stories. New York City provides that "all stairways of all buildings shall be enclosed on each floor with fire and smoke-proof partitions and doors, all such doors to be self-closing." No locks or latches should be allowed on these doors. For purposes of filing pupils out, many principals will ask for some form of door holder to keep doors open; but a pupil or janitor should be detailed to see that they are kept closed after the class has passed through. For purposes of transmitting light these doors may be largely of wired glass, and it is well to specify polished or transparent wire glass for use at the eye level.

The outside exit doors should either be single doors with locks always free on the inside or double with some form of push bar or "panic" bolts which automatically release the standing leaf by the pressure of the body. The old fashioned, T-handle vertical bolt is still allowed by law, but it works stiffly and has nothing to recommend it. The unspeakable top and bottom bolts without the T-handle, which caused much of the trouble at the Collingwood School fire, should never find a place even in the cheapest schoolhouse. No rolling, sliding, or revolving door of any type should find a place in a schoolhouse.

In large school buildings the outside tower stairs have points of great advantage. This form of stairway is constructed in a "tower," which while contained within the main walls of the building is entirely separated from the interior of the structure by heavy brick walls, possibly with metal sash and wired glass to admit light to the corridor. It can only be approached by the pupils passing to an outdoor balcony, whence access is had to the tower and stairs. This form of stairway is used in Philadelphia, Chelsea, and elsewhere with marked success, and deserves to be more generally adopted, as any stairway whose approaches are absolutely open to the outside air must be safer than one within the building.



Cross Section of Typical New York Double Reverse School Stairway
C. B. J. Snyder, Architect

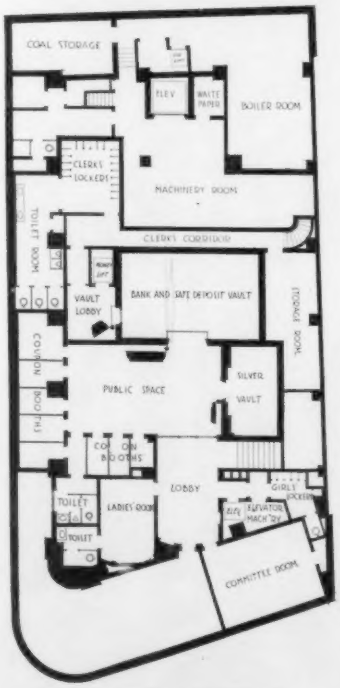
HARTFORD NATIONAL BANK, HARTFORD, CONNECTICUT
DONN BARBER, ARCHITECT

BANKING ROOM

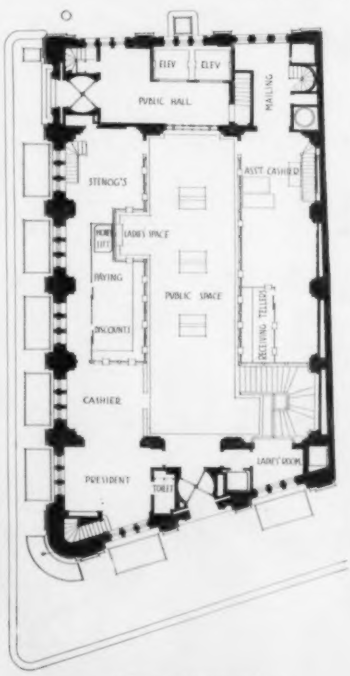
HARTFORD NATIONAL BANK, HARTFORD, CONNECTICUT

DONN BARBER, ARCHITECT

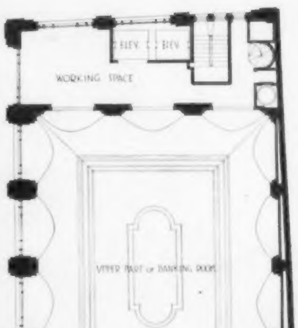
DIRECTORS' ROOM



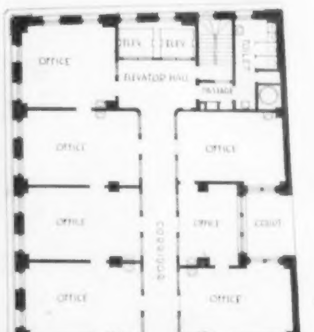
BASEMENT FLOOR PLAN



FIRST FLOOR PLAN



MEZZANINE FLOOR PLAN



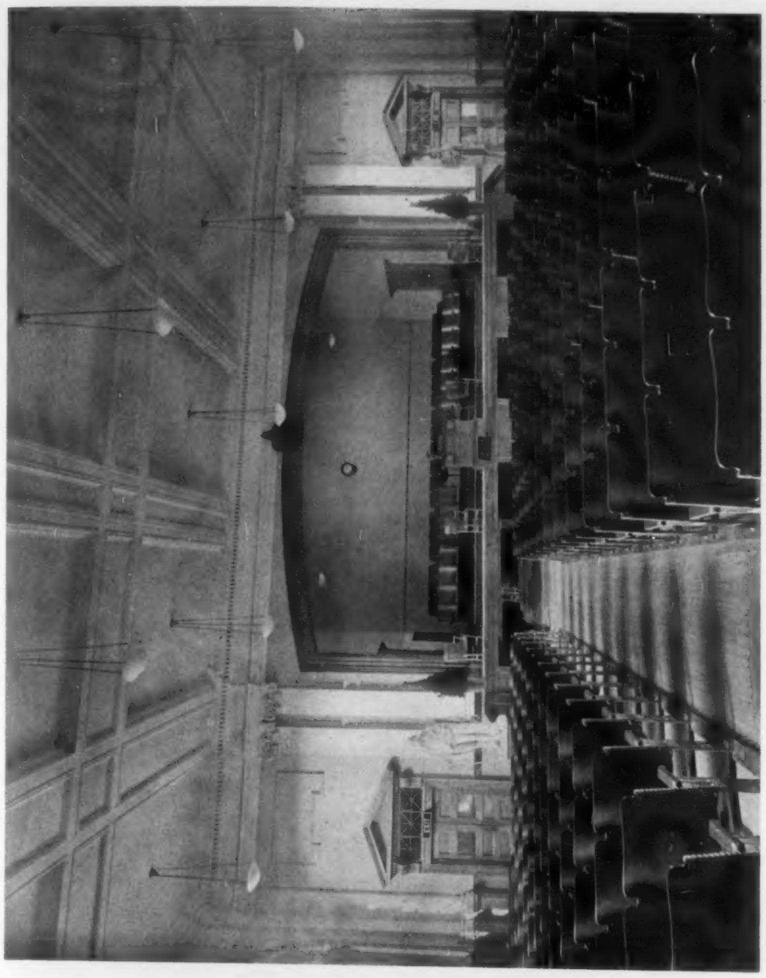
FIRST OFFICE FLOOR PLAN

HARTFORD NATIONAL BANK, HARTFORD, CONNECTICUT

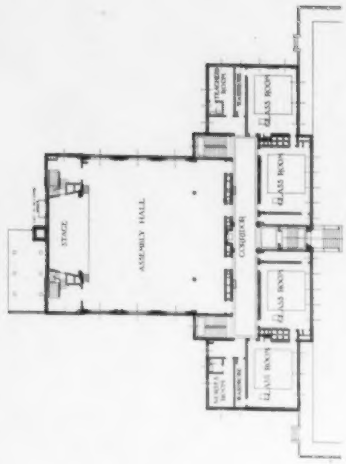
DONN BARBER, ARCHITECT

EDWARD DEVOTION SCHOOL, BROOKLINE, MASS.

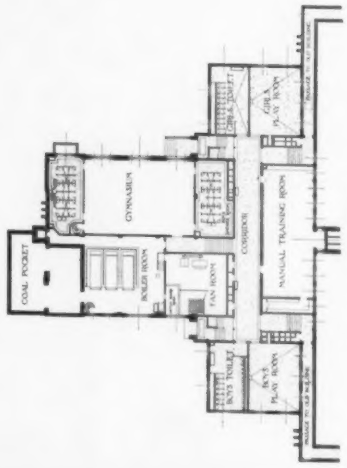
KILHAM & HOPKINS, ARCHITECTS



ASSEMBLY HALL



FIRST FLOOR PLAN

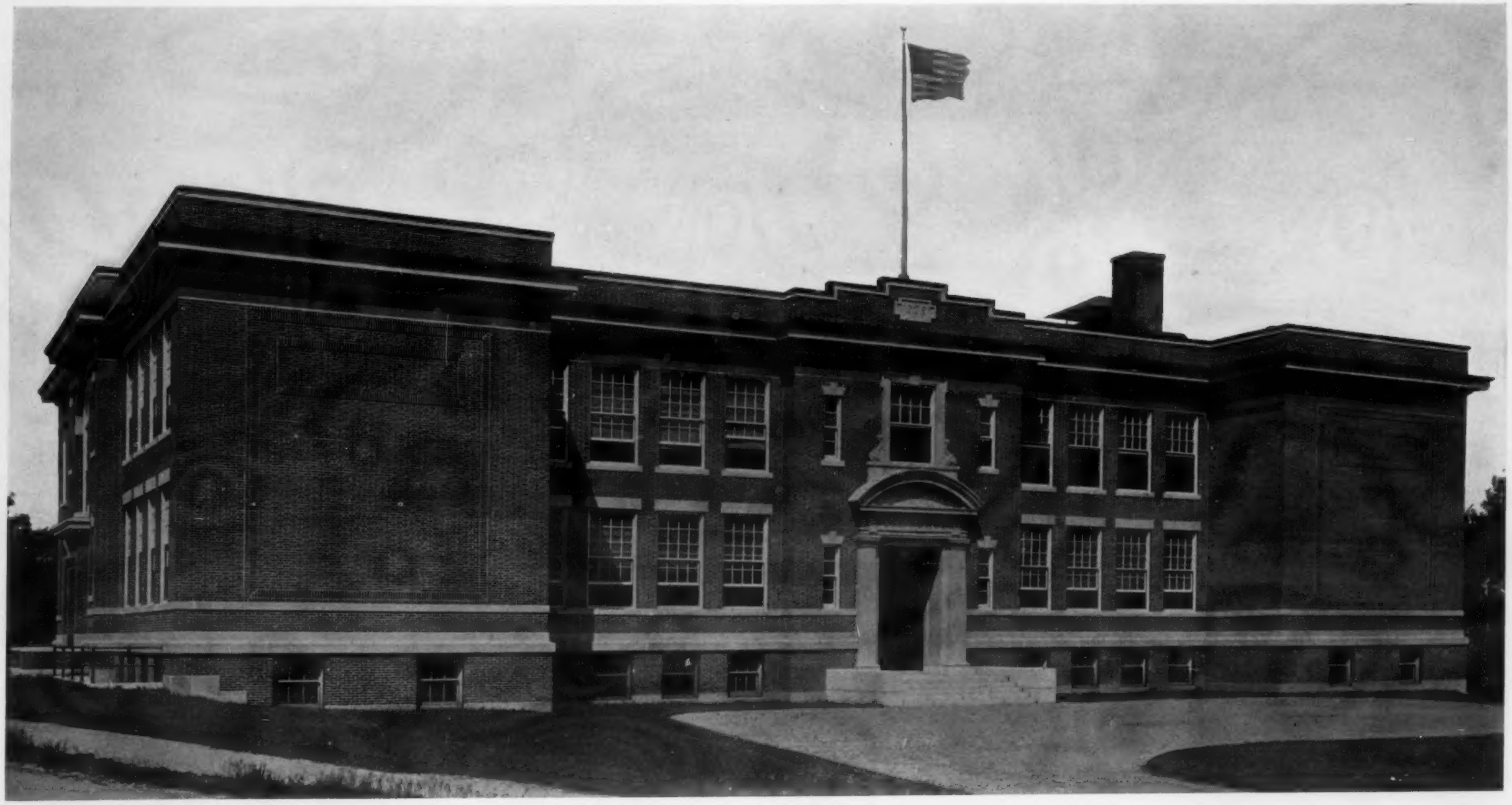


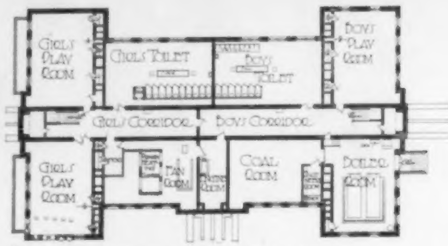
BASEMENT FLOOR PLAN

ENTRANCE DETAIL

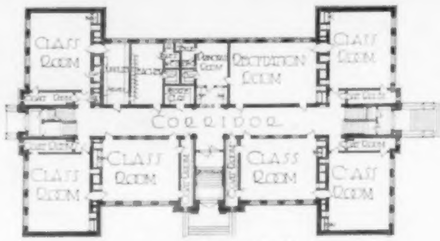
EDWARD DEVOTION SCHOOL, BROOKLINE, MASS.

KILHAM & HOPKINS, ARCHITECTS





BASEMENT FLOOR PLAN



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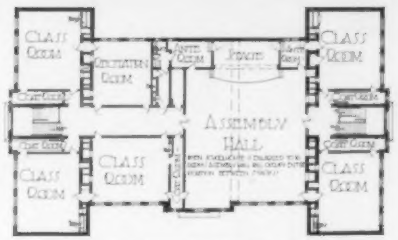
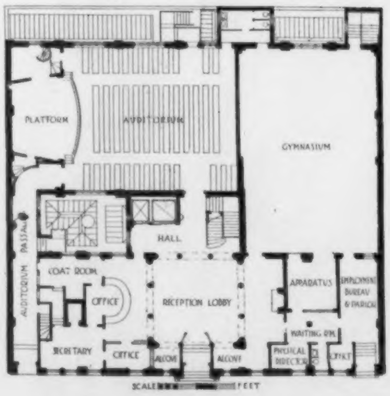


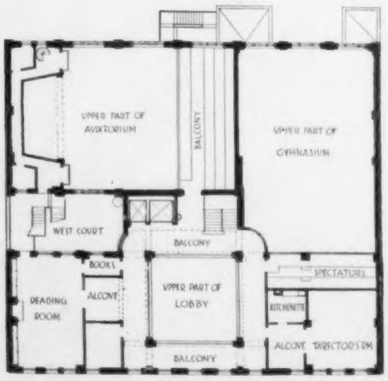
SECOND FLOOR PLAN

VOSE SCHOOL, MILTON, MASS.

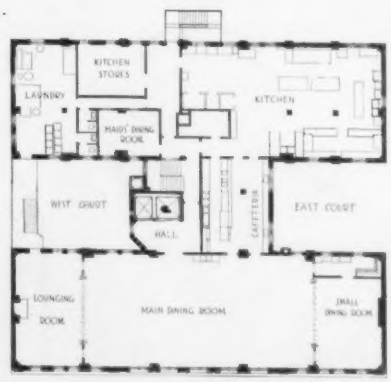
KILHAM & HOPKINS, ARCHITECTS



FIRST FLOOR PLAN



MEZZANINE FLOOR PLAN



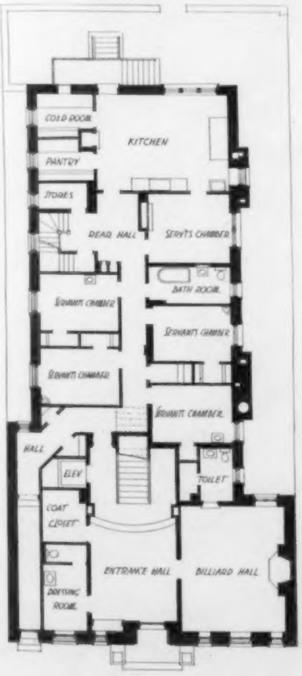
SEVENTH FLOOR PLAN

YOUNG WOMEN'S HEBREW ASSOCIATION BUILDING, NEW YORK, N. Y.

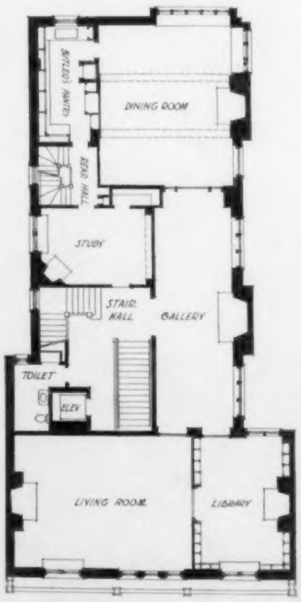
LOUIS ALLEN ABRAMSON, ARCHITECT

HOUSE OF THOMAS C. DENNEHY, ESQ., ASTOR ST., CHICAGO, ILL.
FREDERICK W. PERKINS, ARCHITECT

DINING ROOM

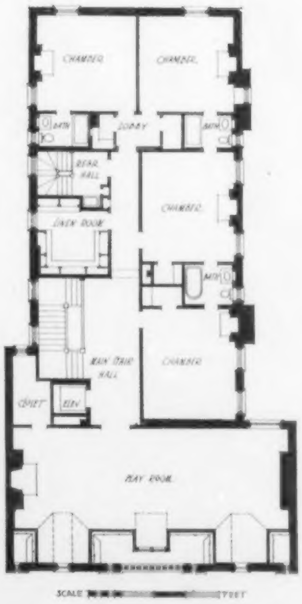


FIRST FLOOR PLAN



SECOND FLOOR PLAN

THIRD FLOOR PLAN

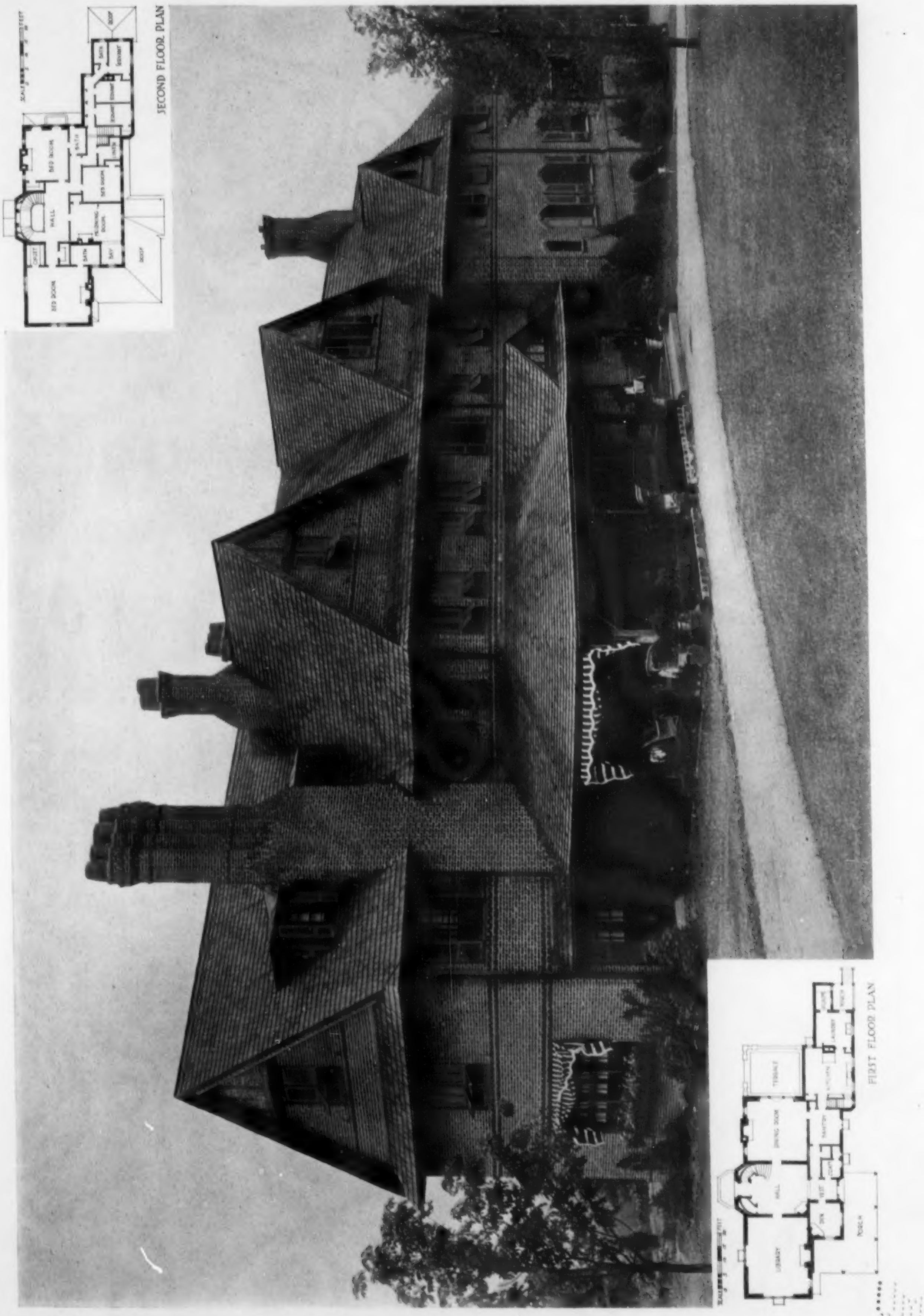


FOURTH FLOOR PLAN

HOUSE OF THOMAS C. DENNEHY, ESQ., ASTOR ST., CHICAGO, ILL.

FREDERICK W. PERKINS, ARCHITECT

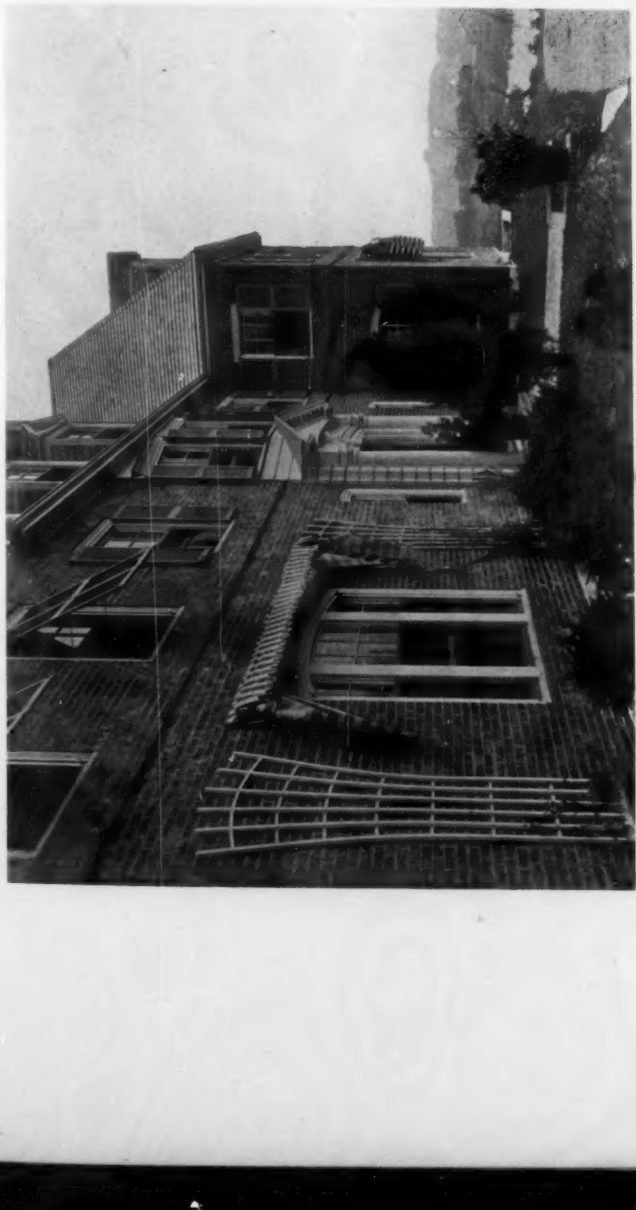
HOUSE OF MRS. E. G. HOOD, CHESTNUT HILL, PA.
STEWARDSON & PAGE, ARCHITECTS



HOUSE OF MRS. E. G. HOOD, CHESTNUT HILL, PA.
STEWARDSON & PAGE, ARCHITECTS

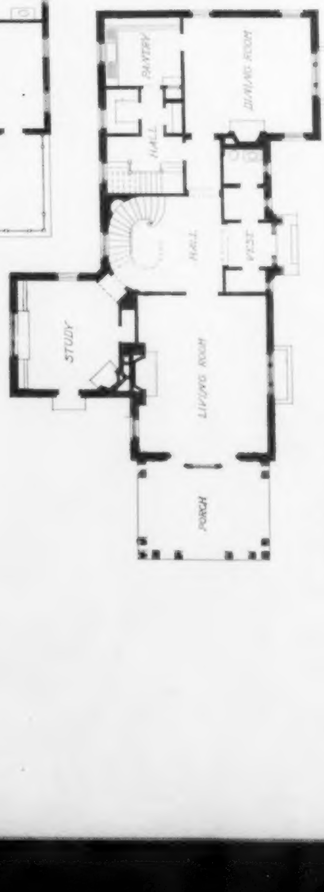
HOUSE OF AUGUSTUS N. RANTOUL, ESQ., IPSWICH, MASS.
ANDREWS, JAQUES & RANTOUL, ARCHITECTS

DETAIL OF ENTRANCE



VIEW ALONG TERRACE

SECOND FLOOR PLAN



FIRST FLOOR PLAN

HOUSE OF AUGUSTUS N. RANTOUL, ESQ., IPSWICH, MASS.

ANDREWS, JAQUES & RANTOUL, ARCHITECTS

ENTRANCE HALL

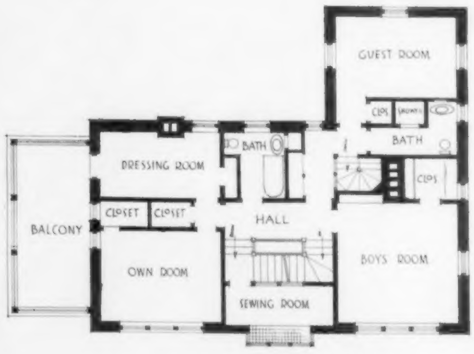
DINING ROOM

HOUSE OF AUGUSTUS N. RANTOUL, ESQ., IPSWICH, MASS.

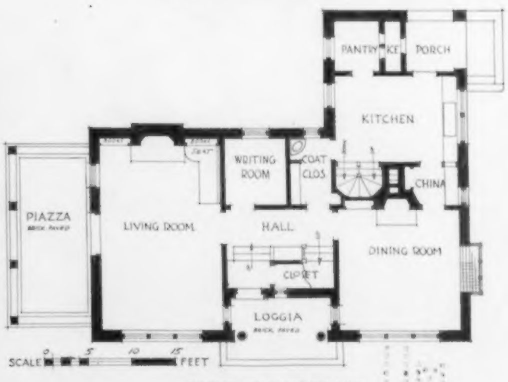
ANDREWS, JAQUES & RANTOUL, ARCHITECTS

VIEW FROM STREET

DETAIL OF ENTRANCE



SECOND FLOOR PLAN



FIRST FLOOR PLAN

HOUSE ON SOMERSET ROAD, LEXINGTON, MASSACHUSETTS

W. R. GREELEY, ARCHITECT AND OWNER

Some Old and Unfamiliar Spanish Buildings.

PART V. THE COURT HOUSE AND PRISON, BAEZA; CASA DE MIRANDA, BURGOS; COLEGIO DEL ARZOBISPO, SALAMANCA.

By ARTHUR G. BYNE.

Illustrated from Photographs Specially Taken by the Author.

BAEZA and Ubeda, two little-known towns close together in northern Andalusia, richly repay an architect's visit, having fine civic buildings as well as interesting churches. Beyond the fact that each was the home of prosperous nobility (until the unfortunate day when all the provincial noblemen aspired to live in Madrid) no local historian has shown any reason why such excellent architecture should be found in these remote and never important places. It is known that Pedro de Valdelvira, who started the cathedral of Jaen, in 1532, came up to them to build a church or two; but no one who has seen his perfect but soulless Renaissance work at Jaen, could attribute to him the charming spontaneous façades of the Casa Consistorial, or the Carcel (prison) of Baeza — the latter being the subject illustrated here.

This example shows to a preëminent degree the masterly way Spanish architects had of concentrating their ornament in doors and windows — a scheme helped by the patio plan which permitted the first floor to go practically unfenestrated towards the street. Another Spanish feature that invited to rich spotting was the lavish use of heraldic *motifs;* noble blood being the most important consideration to the occupants of a mansion, they never failed to announce their claims to it.

The windows in this example are Palladian but with the substitution, for the regular Palladian column, of the slender Moorish one that figures in *ajimez* (three-light) windows. Convention is again thrown to the winds in the cornice; for its crowning moulds instead of being the expected cyma and facia, are merely a large scale egg-and-dart. This is so overshadowed by the projecting tiles above, which in a measure play the part of the crown moulds, that it ceases to be unobtrusive or ungainly and becomes instead a highly interesting departure.

Casa de Miranda, Burgos. Nothing more melancholy than the present abuse of this ancient palace could be imagined. The beautiful patio, of which a corner is shown, is now bricked-in in the upper story and each bay rented out as a room; while the lower floor is so stained and bespattered by the wine-makers who inhabit it that it resembles an abattoir.

Delapidated though it all is, its richness and good taste announce themselves at first glance. The charming *amorini* frieze of soft Spanish granite is very delicately executed; the columns are decidedly Spanish, being a stone adaptation of the wooden bracketed column essential in the light wooden construction of the Moors. Spanish architects saw the decorative value of this member and combined it interestingly with the Corinthian capital. In this instance the corner member, so often slighted and treated haphazardly, is well studied, with its one volute retained between the two Moorish corbels.

Besides the patio there are several other fine apartments equally suggestive of plastic material, particularly the handsome portal to the now crumbling staircase with its sculptured columns and armorial bearings.

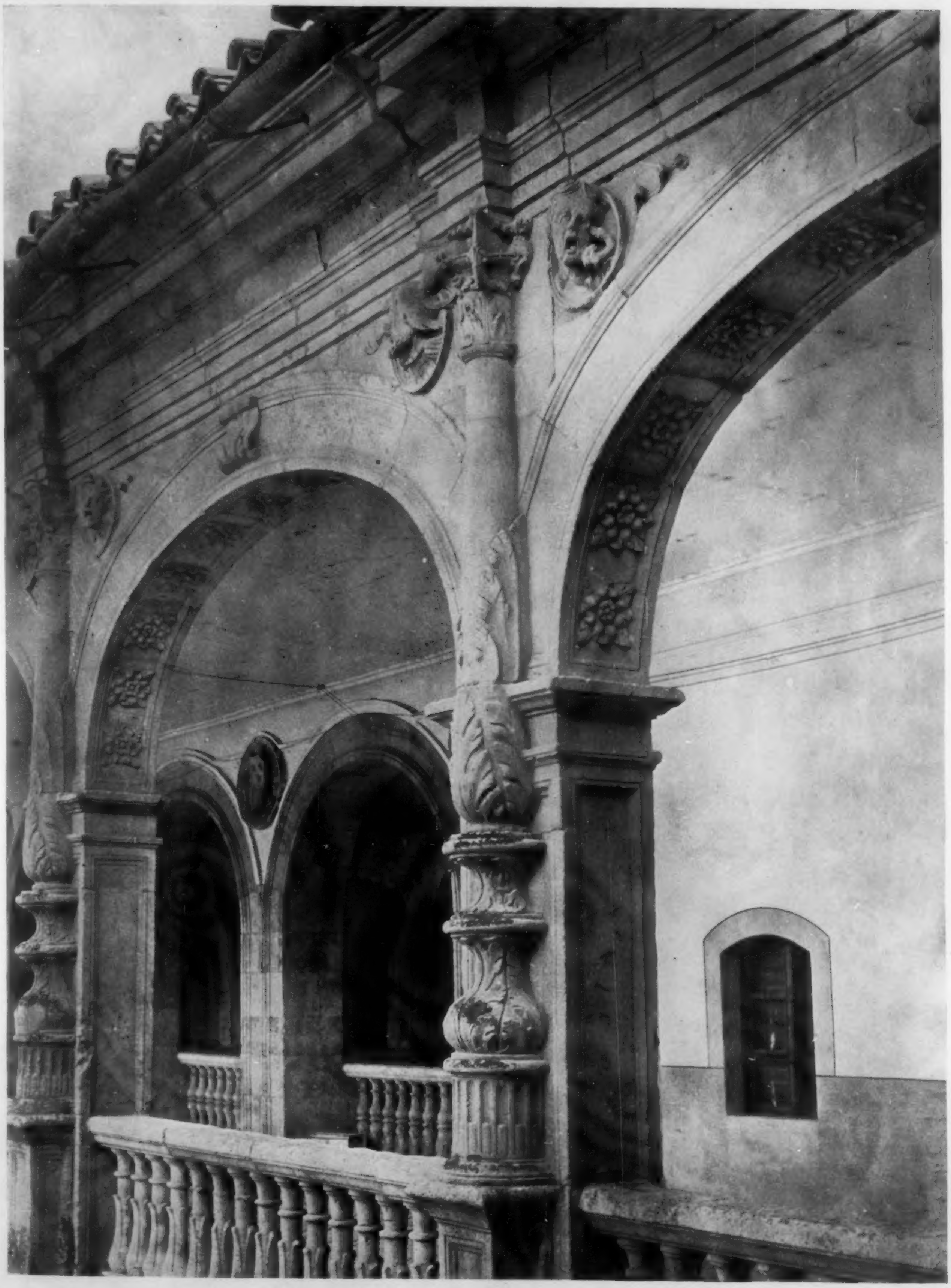
The Casa de Miranda is dated 1543, but there is no record of its builder. There is a story told of an American millionaire trying to buy it to remove and rebuild in his own land, and being frustrated by a noted Spanish architect. The latter, noting with grief how many works of art leave the country, has been trying for some time past to collect enough money to reclaim the Miranda, but money is not abundant in Spain. On hearing of its pending removal, he personally visited every mason in Burgos and got him to pledge himself not to be hired out for the purpose of demolishing it. When, therefore, the American's representative came to inquire the cost of demolition he could not find a contractor to undertake the job, and the whole scheme was abandoned. I give the story as illustrative of a fine unmercenary spirit.

Colegio del Arzobispo, Salamanca. The Colegio Arzobispal was founded in the early XVIth century by the Archbishop of Toledo, Don Alfonso de Fonseca y Ulloa, whose father had built the beautiful Casa de las Muertes already illustrated in THE BRICKBVILDER. The Colegio was commenced in 1527 after plans by Pedro de Ibarra; two other Spanish architects likewise strongly influenced by Michelangelo worked towards its excellence — Alonzo de Covarrubias and Alonzo Berruguete. The result is the best building in Salamanca; and the best part of the building is the patio (accredited to Ibarra alone) which, according to some authorities, stands untouched in Spain for simplicity and purity of line.

Here, as in most patios, the floors instead of being supported by masonry vaults, as would be the case in Italy, are tiles resting on wooden beams; this permits of a light and slender architectural treatment often extending several stories high. Convents and Colegios (priests' seminaries) were so numerous and so vast in Spain that economy had to be considered in their structure. Street and patio façades were of stone, while inner patio walls were of stucco, relieved only by a finely designed door or stairway, as has been shown in the Alcalá example. The result was highly effective as well as economical. There is nothing quite like this patio in Italy; its colonnettes, its capitals, its portrait medallions, its cornices, are all distinctly Spanish — less exuberant and, therefore, in better taste, than earlier patios. Seen through the arches is the distant stair hall always emphasized, and legitimately, by considerable ornamentation, for it is often the only interior feature that departs from conventual plainness.

The old Colegio is now known as the "Nobles Irlandeses," or seminary for Irish priests. The number in training is generally about twenty.

CORNER OF THE PATIO
CASA DE MIRANDA, BURGOS, SPAIN



DETAIL OF THE PATIO
COLEGIO DEL ARZOBISPO, SALAMANCA, SPAIN

STREET FACADE
COURT HOUSE AND PRISON, BAEZA, SPAIN

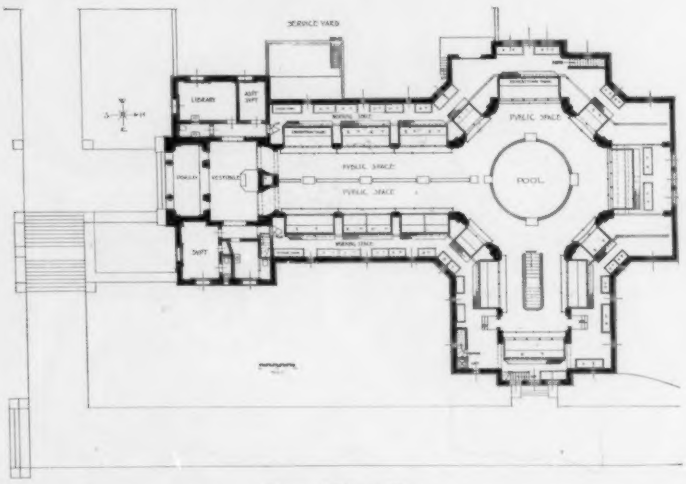
The Aquarium and Winter House for Birds for the City of Boston.

By WILLIAM DOWNES AUSTIN.

THE Boston Aquarium is located in Marine Park, at South Boston. It was built by the City of Boston and paid for out of an income from the Parkman fund — a bequest of George Parkman to the city for the improvement and maintenance of the city parks.

The building is primarily and principally to provide facilities for the exhibition of fishes and only very secondarily for the promotion of scientific study.

The exhibition tanks, each about 5 feet high and 3 feet 6 inches deep, are built of cypress planks and are of such varying lengths that they can be subdivided into two, three, four, and five compartments, each with a front 4 feet 6 inches high and 3 feet $1\frac{1}{4}$ inches wide of polished English plate glass $1\frac{1}{8}$ inches thick. The partitions are of similar glass, but unpolished and only $\frac{7}{8}$ of an inch thick. There are fifty-five of these compartments.



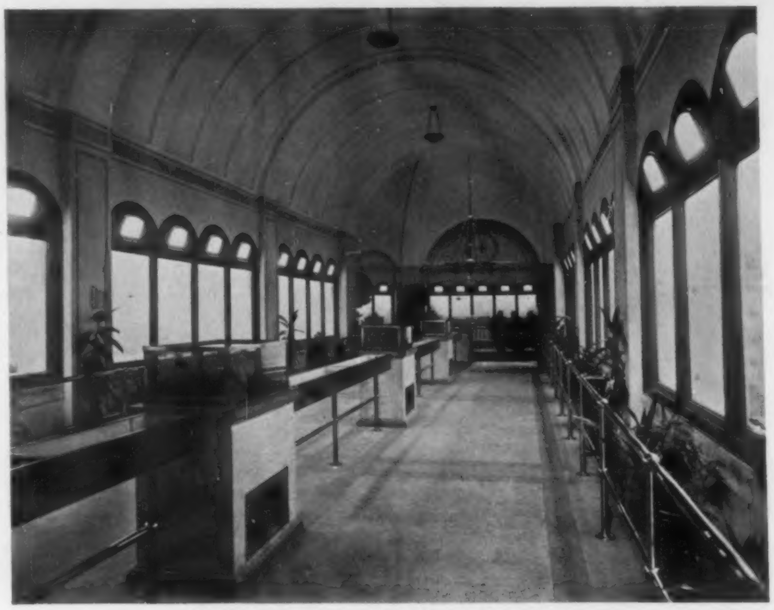
Ground Floor Plan

The tanks stand in the working spaces on concrete floors raised about 2 feet above the main floor of the public portions of the building. They are lighted by skylights in the low roofs of these working spaces. The public portion is lighted in the daytime by sunlight and in the evening by electric light diffused through the water in the tanks behind the glass fronts. Provision is made for the exhibition of local salt water fishes, for specimens from warm southern salt water, for local fresh water fish, and for trout which require refrigerated water in warm weather. An underground reservoir with a

Aquarium, Marine Park, South Boston, Mass.
William Downes Austin, Architect

capacity of 100,000 gallons is provided for the storage of salt water which is brought from the harbor near by into the reservoir through a pipe line. From the reservoir the water is pumped to distributing tanks in the attic, from which the exhibition tanks are supplied by gravity. One distributing tank is fitted with a steam coil for warming the salt water for the tanks containing the southern fishes.

The fresh water tanks are supplied from the city service. Water in all the tanks is in constant circulation, and the salt water returns through filter beds into the underground reservoir. The refrigerated fresh water is also filtered and used again. The ordinary fresh water wastes into the city sewer.



Interior of Aquarium Looking Towards Rotunda

The building has brick exterior walls covered on the outside with rough cast plaster. The foundation walls are concrete. The underpinning courses and exterior steps and retaining walls are of cut granite composite. The roofs are wooden construction covered with red shingle tiles. Except the roofs, the building is entirely first class construction. The interior floors and walls of the public portions are terrazzo in different colors. The frames enclosing the glass fronts of tanks are painted cast iron. The ceilings are rough plaster. The details in the entrance porch are clear white marble and the walls of the porch are paneled with different colored polished foreign marbles. The building covers about 8,000 square feet. The total cost, including all equipment and architect's and engineer's commissions, was $135,778. The building was first opened to the public in November, 1912.

Detail of Entrance to Aquarium

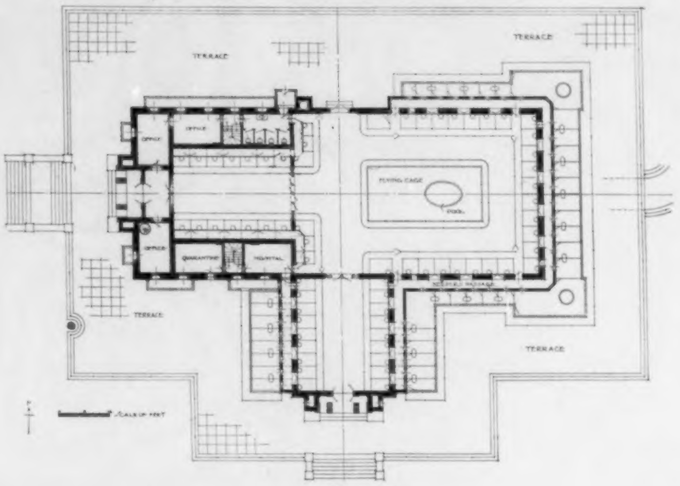
The Winter House for Birds is located in Franklin Park and is the pioneer building of the Zoo. It was built by the City of Boston and paid for by funds from the same source that provided the Aquarium. Its purpose is what its name implies, plus the provision for exhibiting the birds.

The principal requirements of such a building are: plenty of light and warm fresh air for the birds; cages of different sizes suitable to the various kinds of birds; sufficient space for the public; a large flying cage in the center of the room; provision for feeding the birds from the rear of the cages through small doorways opening into keeper's passages; outside cages against the walls of the building, with tiny doorways connecting each exterior cage with an interior one to enable birds to enjoy indoor or outdoor life at their pleasure or that of the keeper; roosts or shelters in the exterior cages, protected by narrow glass roofs; facilities for a bird bath in each cage; kitchen in basement for preparation of bird food; storerooms in basement; heating and ventilating apparatus; a bird hospital; a quarantine room; the usual offices,

and bed and bath rooms for keepers.

The exterior walls are brick and vaulted with rough cast plaster on the exterior. The windows in the frieze and elsewhere are enclosed in frames of glazed terra cotta in patterns of green and cream. The main roof is principally glass, the balance being copper on boarding. The entrance porches have cast iron columns, wooden superstructure, and ornamental copper roofing. The columns and superstructure are elaborately modeled and carved, and the porches are painted and lacquered throughout in vermilion, and dull gold with minor tones of blues, grays, yellows, browns, and greens.

The terraces around the building are paved with roughish granolithic in squares of 3 feet, in slightly different colors, giving a faint checkerboard effect. All stone trimmings and



Ground Floor Plan

Detail of Principal Entrance

Winter House for Birds, Franklin Park, Boston, Mass.
William Downes Austin, Architect

steps are of cut granite composite. The interior walls are plastered directly on the brickwork and are tinted a soft gray-green color. All cages are painted black. Floors of cages are concrete and about 2 feet 6 inches above the main floor of public portion. Finished floors of public portions and the walls under the fronts of cages are terrazzo. The two narrow exhibition rooms are separated from the main room by plate glass screens and glass doors.

The building was completed in October, 1913. Its total cost, including all equipment and architect's commission, was $116,116. Exclusive of the terraces the building covers 9,280 square feet. The terraces average 30 feet in width.

Its style of architecture is quite a departure from the usual but the ideal setting in an oak grove, adjacent to a lawn for displaying peacocks, and a great outdoor flying cage where brilliant plumage attracts the eye suggested an unusual treatment, and the Japanese style which would permit of lively color seemed a fortunate one to emphasize the building in its setting.

Winter House for Birds, Franklin Park, Boston, Mass.
William Downes Austin, Architect

PLATE DESCRIPTION.

EDWARD DEVOTION SCHOOL, BROOKLINE, MASS. PLATES 19, 20. This school forms the central and dominating structure of a complete group of three buildings. It is connected to the other buildings by tunnels and terraces and contains the heating plant for the group.

The assembly hall seats one thousand persons. It is finished with fumed oak and French gray plaster. The gymnasium is sunny and well lighted and is equipped with showers and dressing compartments of Tennessee marble. Two observation galleries are provided. The stairs are of steel and North River stone, and the construction of the assembly hall and boiler room portion is fireproof, the balance being second class construction with brick walls, partitions and stacks, the ceilings and minor partitions being wire lathed. The exterior walls are buff brick to match the existing buildings and the trimmings of gray terra cotta, with a green slate roof and copper lantern.

A new type of window used in the class rooms admits a large amount of outside air when open. The building is splendidly and thoroughly finished in every part and cost about $130,000, or approximately 19 cents per cubic foot, including general contract, plumbing, heating and ventilating, and electric work.

VOSE SCHOOL, MILTON, MASS. PLATE 21. The exterior is of red water-struck brick, laid in Flemish bond, with gray terra cotta trimmings. Heat and vent ducks and practically all interior walls are brick. The floor and roof frames are steel girders and trusses and Georgia pine joists. The staircases are all fireproof, made of iron and slate enclosed in brick walls. The roof is of asphalt composition, with copper flashings. The ventilation is by fan driven by electric motor, forcing the fresh air through concrete tunnels under the basement floor to the brick up-takes with automatic temperature control.

The interior finish is in ash with burlap dadoes. The intention was to secure not extreme cheapness but the most durable and attractive results. While not strictly "fireproof" in every sense of the word, the building is nearly so in fact and is fully as secure from fire danger as a building of the first class.

The cost, including the general contract, plumbing, heating, ventilating, and power plants, lighting fixtures, granolithic outside walks and steps, and grading, seeding, and curbing the grounds, and a playground 720 feet by 300 feet, was $84,377, or about 17 cents per cubic foot.

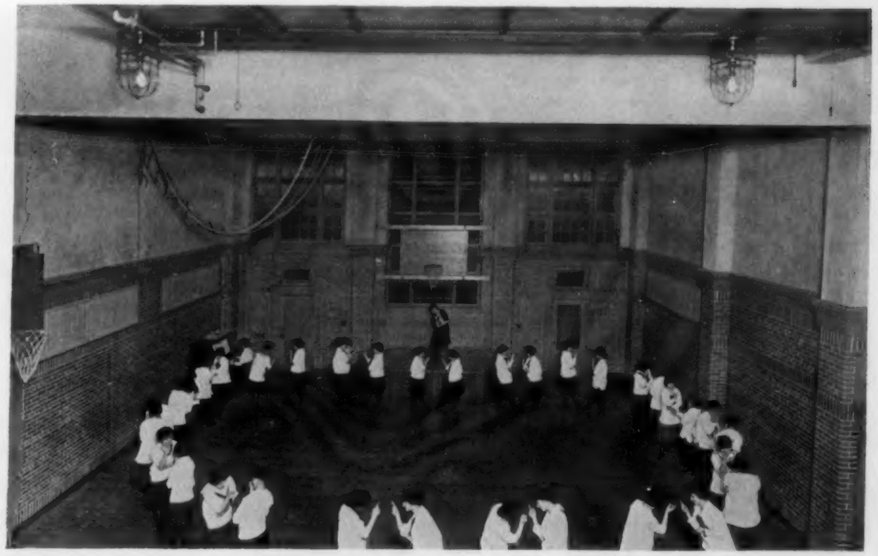
YOUNG WOMEN'S HEBREW ASSOCIATION BUILDING, NEW YORK CITY. PLATE 22. This building is located on a plot 100 feet by 100 feet, facing south, overlooking Central Park north and is the first of its type of any magnitude to be designed.

One of the most difficult problems to solve was that of providing a sufficiently large building for the amount of money available. This was accomplished by the development of a "dual plan," that is, making possible the usage of one room for two or more purposes. Thus, the auditorium, by means of concealed doors and removable appurtenances, is transformed from auditorium to synagogue; the gymnasium is likewise transformed into a spacious dance room, the spectator's gallery of the former being used as a musician's gallery for the latter. The physical director's office and lavatory is a rest and dressing room for the dancers. The room used as an employment office, with outside entrance at night, is a Penny Provident Fund Department for children by day.

Another problem was arranging the different rooms so that the activity of one would not interfere with the use of any of the others. Thus, all of the noise creating departments, such as the power sewing machine, typewriting, and domestic science rooms, are placed on one side of the building; whereas the classes in stenography, languages, and arts are on the opposite side.

The building contains dormitories of one, two, and three beds each. The ceiling heights in these stories are low, but not unpleasant, namely, 9½ feet from floor to floor.

AUDITORIUM



GYMNASIUM

MAIN DINING ROOM

LOBBY

THE YOUNG WOMEN'S HEBREW ASSOCIATION BUILDING
LOUIS ALLEN ABRAMSON, ARCHITECT

(See Plate 22)

Editorial Comment.

THAT architect is rare who can succeed, under present conditions, solely because of his talent for design. At his best he is rivaled by the man proficient in promotion, and is crowded by the good office organizer. Not only this, but he sees many commissions entrusted to practitioners whose nominal presence in the profession is to its continual detriment. It is unnecessary to expand upon the difficulties of the general situation. Remedial action has included state legislation for the licensing of architects and professional society legislation fixing a schedule of minimum charges. State legislation can never assist the æsthetic or essential side of architecture, and people will pay any price for something that they understand and want. To secure for the profession recognition and respect, the first effort should be to establish standards for minimum service; and, the second, to unite to get the chores done in such a manner that the individual can devote himself to the essence of his profession; so that he can, in other words, have time to exercise those particular talents which have made his profession peculiarly valuable.

Standards of æsthetic production are indefinable and unnecessary. The layman who can appreciate the definition of a work of art appreciates the work itself still better. But, on the other hand, standards for the accumulation on drawings and in the specifications of the data necessary for the construction of a building and for the direction of the work are very much needed; and a knowledge of high standards on the part of the public, which purchases services in these forms, will discourage or do away with dealings with those incapable of providing service conforming to high standards. When architectural societies are as jealous of standards as legal societies, they will be entrusted by the state with their enforcement. A good many offices have carefully studied the arrangement of drawings, the lettering, dimensioning, indication of materials, and details of heating, lighting, and so on. Let these be taken by the local society and extended into a complete scheme, setting forth, for various types of building, the minimum amount of description of plan, elevation, section, construction and engineering of various kinds, and of supervision and direction, that shall constitute service according to the views of the local society. Any attempt to establish æsthetic standards is unlikely to result appreciably in this generation or the next; but clear distinctions between one kind of service and another on the basis of this suggested discrimination will be comprehensible to the layman at once.

The other suggestion has for its purpose the liberation of the artistic temperament. It contemplates strong local societies with very heavy dues, $200 to $300 or more per year, for members in active practice, and perhaps varying in proportion to the gross earnings of each practitioner; for it will be the function of these societies to do a great deal of that work of its members which is not distinctly architecture. Every office must now do, besides design, some engineering, a lot of bookkeeping, and must acquire some experience in and knowledge of law. The society will, to relieve each office of part of this work, have offices of its own and will retain, for the common benefit and use, engineers for surveying, steel and concrete work, heating and ventilation, electric work, plumbing, and so on, and all the work done along these lines will be done according to standards established by the society, and the experience gained will be to the advantage of all its members. Among the duties of this staff will be the scientific investigation of all materials and apparatus which enter into buildings and the establishment of standards for all materials, comparable to those set up by the National Board of Fire Underwriters, and others. This department could also make lists of quantities and prepare preliminary estimates.

The accounting department will establish standards for office bookkeeping, so that after a while an architect can form some idea in advance as to how much a drawing or a set of drawings ought to cost, and how long it ought to take to make it. It will work out the best forms for orders and certificates and audit the office account of the owner's expenditures, and payments to contractors, and will be of assistance in many other ways which are sure to develop.

The legal department will, in the first place, keep up to date on building law, maintaining copies of all important laws and, as far as possible, having duplicates for the use of members. It will be its duty to study proposed laws, inform the society of action necessary, and notify members of enactments. This department can maintain service in the registries to inform members of attachments and liens on the properties for which they are responsible.

The possibilities of these departments have been sketched not completely or because this outline represents more than a small part of the scope of such architectural societies, but because, in even so brief a view, the possibilities seem so great.

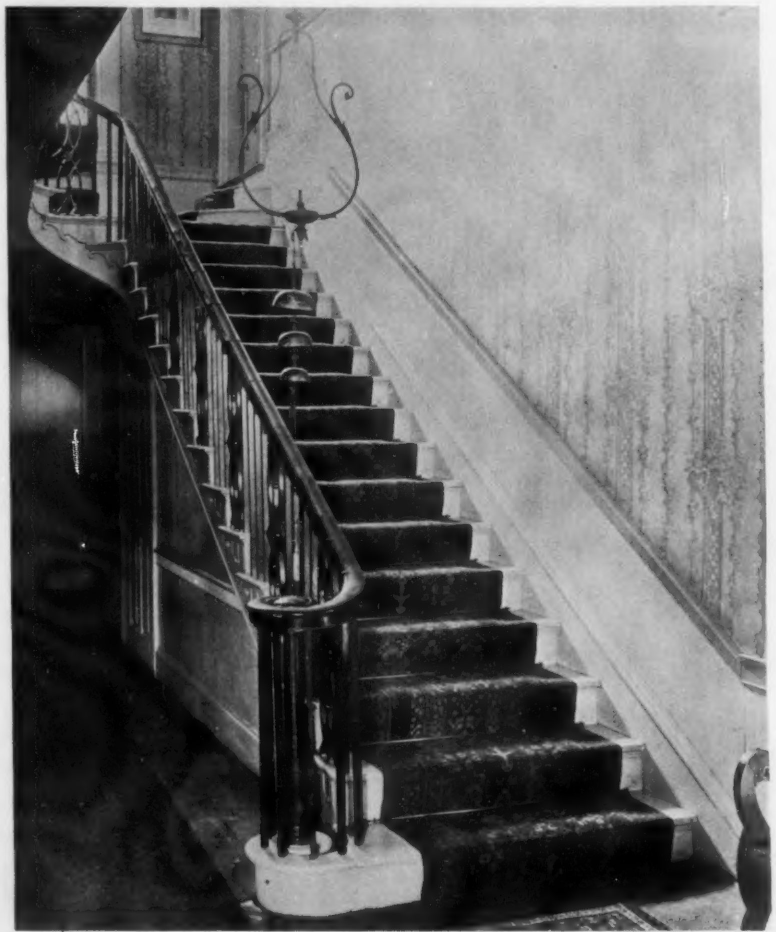
If it is admitted that the ability to comprehend all of the elements of a building and arrange them in an orderly and, if possible, a beautiful way is the job of the architect as against any other, then all the other things are less peculiarly his to do; and when he does them thoroughly, he is only exhausting himself as far as his real ability goes. The other things must be done. When they are slouched by an artist, they hurt the profession as badly as if the neglect were on the part of an untrained man.

If, now, the chores are done by a commission under the direction of an intelligent artist, with the accumulated experience of the society, they can be well done.

The gist of the matter would seem to be that the harassed architectural profession will succeed best by ceasing to talk about compensation until people know completely what its members do to earn it; and then to arrange so scientifically what there is to do so that the part which is peculiarly architecture can be done to the very best advantage.

In selecting representative renderings to illustrate the article on "Monographs on Architectural Renderers," Part XI, published in the December, 1914, issue of THE BRICKBUILDER, five of the drawings were chosen from *Moderne Bauformen*, and reproduced from that journal. These included renderings by H. Wilson, Edgar Wood, H. Billing, Benirschke, and Hirchmann. We acknowledge with thanks the courtesy extended by *Moderne Bauformen*.

THE BRICKBVILDER COLLECTION
EARLY AMERICAN ARCHITECTURAL DETAILS



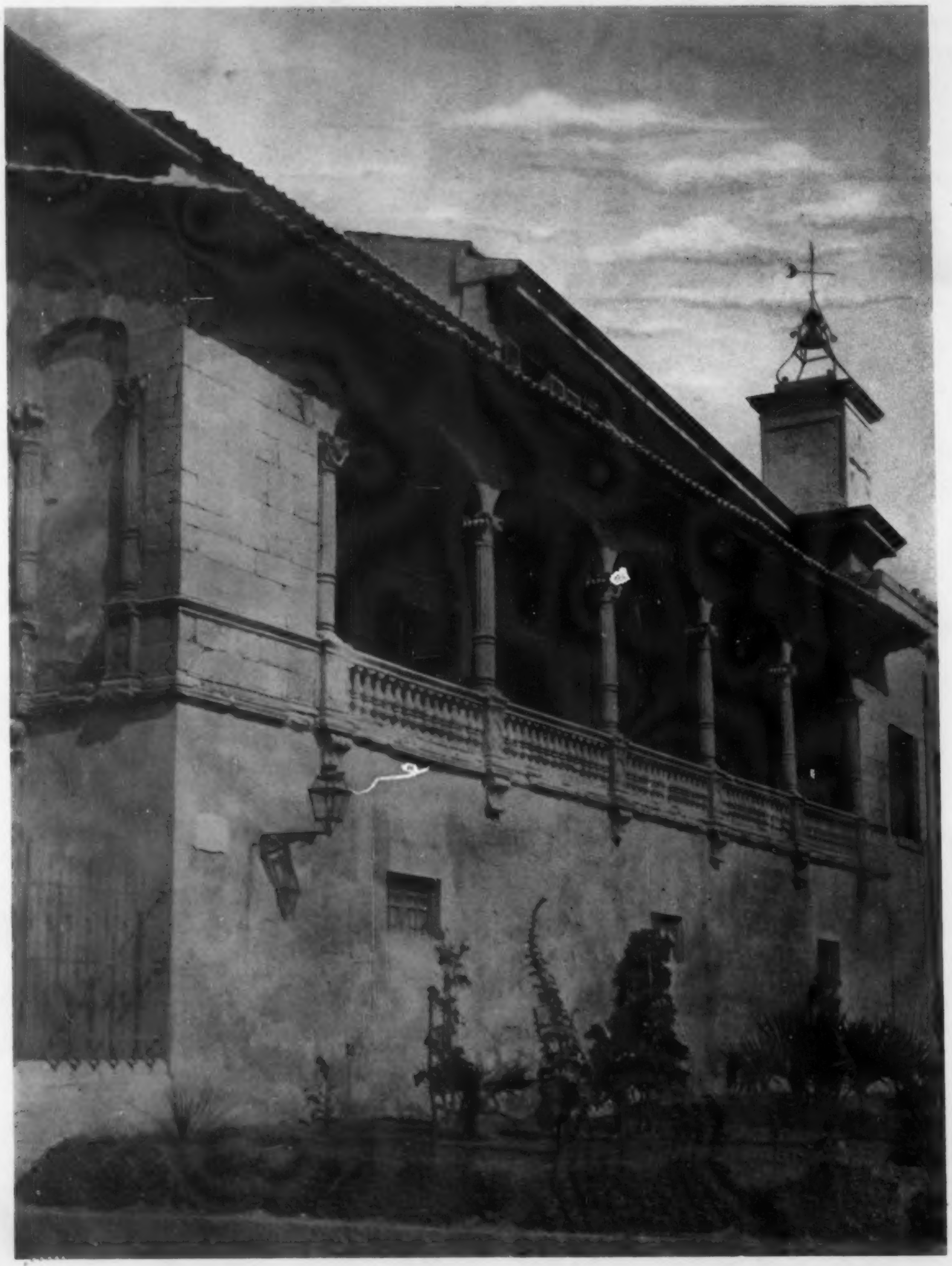
MAIN STAIRWAY IN THE NICHOLS HOUSE, SALEM, MASS.
SAMUEL McINTIRE, ARCHITECT — BUILT IN 1800

MEASURED AND DRAWN BY
GORDON ROBB & M. A. DYER

Plate Three

(over)

PLATE 3 MARCH · 1915	·STAIRWAY · IN · NICHOLS · HOUSE· SAMUEL · McINTIRE - ARCHITECT ·SALEM·MASS·	MEASURED - & ·DRAWN · BY· ·GORDON · ROBB· ·& · M·A·DYER·



CONSULADO DEL MAR, PALMA DE MALLORCA, SPAIN

ERECTED IN THE XVIITH CENTURY